COMPREHENSIVE GROUND WATER MONITORING EVALUATION

OF

EKCO HOUSEWARES, INCORPORATED

STARK COUNTY

MASSILLON, OHIO

OHD045205424

OHIO ENVIRONMENTAL PROTECTION AGENCY

MAY 17, 1994

A.3.5

OhioEPA
State of Ohio Environmental Protection Agency

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George V. Voinovich
Governor

June 29, 1994

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Mr. Kevin Pierard, Chief
U.S. EPA, Region V
Ohio-Minnesota Technical Enforcement Section
Hazardous Waste Enforcement Branch, 5HS-12
77 West Jackson Boulevard
Chicago, Illinois 60604

Dear Mr. Pierard:

Please find enclosed the final CME for Ekco Housewares, Incorporated. This document, submitted in partial fulfillment of the 1994 RCRA grant commitment for third quarter, is based on a site inspection conducted on February 15, 1994. This document was prepared by Rich Kurlich of the Division of Drinking and Ground Waters, Northeast District Office of the Ohio EPA, with the assistance of Karen Nesbitt, Environmental Specialist, of the Division of Hazardous Waste Management, Northeast District Office.

If you have any questions, please contact me at (614) 644-2905.

Sincerely,

Thomas Allen, Assistant Chief
Division of Drinking and Ground Waters

TA/KC/dr
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File

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I. GENERAL INFORMATION

Purpose

This report documents the results of a Comprehensive Ground Water Monitoring Evaluation (CME) conducted at the Ekco Housewares, Incorporated, facility in Massillon, Ohio. The objective of a CME is to determine whether the owner/operator has, in place, a ground water monitoring system that is adequately designed, operated and maintained to detect releases or to define the extent of contamination migration within a regulated unit as required by rules 3745-65-90 through 3745-65-94 and 3745-65-75(F) of the OAC. The period of compliance under evaluation for this CME is from December 8, 1991, through February 15, 1994.

Information Sources

This report is based on an extensive record review and a site inspection conducted at the facility on February 15, 1994. The purpose of an inspection is to observe and determine the adequacy of the ground water sampling procedures, obtain ground water surface elevations, verify the number and locations of monitoring wells, perform a surficial monitoring well construction and integrity inspection, and review written records pertaining to the ground water monitoring program. The site inspection was conducted by Rich Kurlich, author, Division of Drinking and Ground Waters (DDAGW-NEDO), and Karen Nesbit, Environmental Specialist, Division of Hazardous Waste Management (DHWM-NEDO). Representing Ekco during the inspection was Tom Cornuet and Greg Flasinski of Weston.

In addition to information gathered during the site inspection and review of correspondence contained in Ohio EPA files, the following documents provided information upon which this CME report is based:

Delong and White, 1963, Geology of Stark County: ODNR Bulletin No. 61.

Morningstar, H., 1922, Pottsville Fauna of Ohio: Ohio Division of Geological Survey Bulletin 25, Fourth Series.

Ohio EPA, 1988, Comprehensive Groundwater Monitoring Evaluation of Ekco Housewares, Incorporated, Massillon, Ohio: Ohio EPA, June 27, 1988.

Ohio EPA, 1991, Comprehensive Groundwater Monitoring Evaluation of Ekco Housewares, Incorporated, Stark County, Massillon, Ohio: Ohio EPA, June 7, 1991.

Schmidt, J.J., 1962, Underground Water Resources of the

Tuscarawas River and Sugar Creek Basins: ODNR Map.

Weston, R.F., 1988, Ground Water Quality Assessment Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, March, 1988.

_________, 1988, RCRA Closure Plan for Ekco Housewares, Inc., Massillon, Ohio, Volume I (draft): prepared for Ekco Housewares, August 1988.

_________, 1988, Quality Assurance Management Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, September 1988.

_________, 1989, Groundwater Quality Assessment Report for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, May 1989.

_________, 1989, RFI/CMS Work Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, June 1989.

_________, 1992a, 1991 Supplementary Annual Report form, Ground Water Monitoring Information for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, February 1992.

_________, 1992b, RCRA Closure Plan for Ekco Housewares, Inc., Massillon, Ohio, July 1992.

_________, 1993, 1992 Supplementary Annual Report form, Ground Water Monitoring Information for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, February 1993.

_________, 1994, 1993 Supplementary Annual Report form, Ground Water Monitoring Information for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, February 1994.

<u>Inspection Checklists</u>

Attached to this report are several checklists from the RCRA Comprehensive Ground Water Monitoring Evaluation Document (Directive 9950.2) and the Interim Status Ground Water Monitoring Program Evaluation (SW954). The checklists completed for this facility are:

Appendix A: Comprehensive Ground Water Monitoring Evaluation;

Appendix A-1: Facility Inspection Form for Compliance with Interim Status Standards Covering Ground Water Monitoring;

Appendix A-2: Inspection Compliance Form for a Facility which has Determined it may be affecting Ground Water Quality.

II. FACILITY HISTORY AND OPERATIONS

A considerable portion of the text dealing with site history, geology, and hydrogeology was taken from a CME prepared by the Ohio EPA (1988).

Facility Name

Ekco Housewares, Incorporated, Massillon, Ohio.

U.S. EPA Identification Number

OHD 045 205 424

Facility Location

The Ekco Housewares, Inc. facility is located in the northwest portion of Massillon in Stark County at 359 State Avenue, N.W. The facility occupies 13 acres and is primarily surrounded by industrial and urban complexes. The Ekco property is triangular in shape and lies approximately 1,500 feet west of the Tuscarawas River. The facility is bordered to the north by Newman Creek, while the Penn Central and the Baltimore and Ohio Railroads border the Ekco property to the south, west and east. Figure 1 depicts the regional and local location along with local business.

A variety of businesses operate adjacent to the Ekco plant. These include Ohio Packaging (paper) to the south, sand and gravel quarries to the west and northwest, Carter Lumber (retail) and American Drain Pipe (concrete pipe) to the north and the Ohio Water Service (public water supply waterworks) to the east. The Baltimore and Ohio Railroad has numerous spurs and sidetracks adjacent to the Ekco plant that are used for storage of rail cars and Conrail track maintenance vehicles.

Facility Description & Operations

The Ekco Housewares facility has been manufacturing primarily cookware/bakeware since 1945. In 1945, the Ekco Housewares facility was manufacturing aluminum and stainless steel cookware. By 1951, the plant was manufacturing 90 mm and 105 mm shell casings for the military. This process increased production and required the installation of two production wells (W-1 and W-2). In 1953 a surface impoundment was constructed along the northern property boundary adjacent to Newman Creek. Sludge from the waste treatment of the military production was

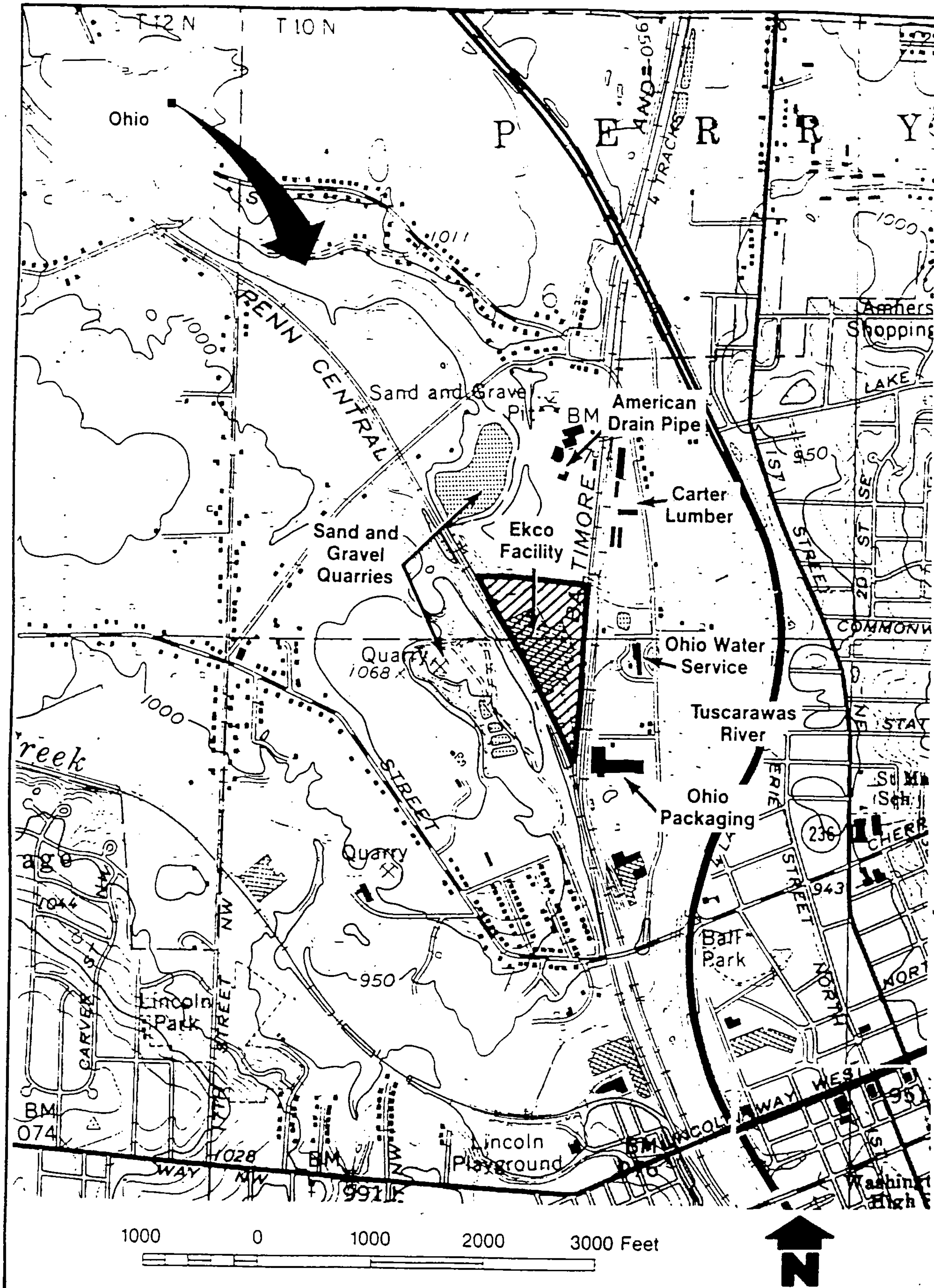

FIGURE 1 SITE LOCATION MAP
EKCO HOUSEWARES, INC., MASSILLON, OHIO

(Ref. 7.5 Minute Massillon Quad, Ohio, 1978) discharged to the surface impoundment.

During 1954, Ekco Housewares began its electroplating operations. The primary function of these operations was to copper plate cookware manufactured at the facility. Solvents (primarily trichloroethylene [TCE] or 1,1,1 trichloroethane [TCA]) were used to clean the products prior to plating. However, TCA and TCE were never used at the same time. Ekco Housewares discontinued use of TCE sometime during the mid 1960's. While copper plating and printing operations were in use after 1954, all process water, including alkaline cleaning rinse waters, boiler blowdown, and deionizer water was piped to the lagoon.

By 1967, Ekco Housewares began to manufacture porcelain and teflon coated cookware. In 1969, Ekco Housewares received a permit to discharge the waste products associated with plant activities to the surface impoundment.

Ekco, however, discontinued the manufacturing of aluminum and porcelain cookware and use of the lagoon ceased in 1977. By the end of 1978, all copper plating operations had ended and the principal products manufactured at the facility became pressed and coated non-stick bakeware. The surface impoundment was reinstated in 1980 under an NPDES permit to receive wastewater. The unit was permanently removed from operation in December 1985.

Ekco Housewares continues to manufacture pressed and coated non-stick bakeware. The operations that generated hazardous waste at the facility include degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent).

Hazardous Waste Generated

Waste products generated at various intervals during the operational history of the Ekco Housewares facility and subsequently disposed in the lagoon include:

Trichloroethylene and 1,1,1 trichloroethane used as a degreasing solvent during electroplating operations starting 1954.

Process water, including alkaline cleaning rinse waters, boiler blowdown and deionizer water from copper plating and printing operations after 1954.

Deionizers from copper plating operations (hydrochloric acid and sodium hydroxide) and washings and waste material from manufacturing porcelain-teflon coated aluminum cookware (aluminum frit, various coloring inorganic oxides, lead, cadmium, selenium, cobalt and toluene) starting 1969.

Ekco discontinued use of the lagoon in 1977. Later, from 1980 until 1985, hazardous waste generated at the facility during degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent) was again discharged to the lagoon. The lagoon was permanently decommissioned in 1985 (Weston, May 1989). Since 1985, all hazardous waste generated at the site has been drummed and shipped off-site to a treatment, storage and/or disposal facility.

Hazardous Waste Treatment, Storage and Disposal Practices

In summary, the surface impoundment (shown on Figure 2) was used noncontinuously for approximately 28 years total. During that time period actual waste products and volumes of liquid or sludge discharged to the impoundment is not well documented. Approximately 0.2 MGD of wastewater potentially containing heavy metals, solids and alkalines was discharged to the lagoon when the plating line was in operation from 1954 until use of the lagoon ceased in 1977. There was not any surface discharge from the lagoon.

In 1984, the company was informed that because hazardous waste was placed in the lagoon since the effective date of RCRA (1980) the lagoon is classified as a hazardous waste surface impoundment.

The facility currently is permitted (NPDES # 3IC00009001) to discharge cooling water to Newman Creek. The source of the cooling water is ground water that is pumped at the facility and only used in a non-contact cooling process and then treated through an air-stripper unit prior to discharge.

Regulatory History

Ekco Housewares notified the U.S. EPA of its Generator Status in August, 1980. However, a Part A application was not submitted by November 19, 1980 as required by 40 CFR 270.10 and Interim Status was not achieved. Ground water contamination was discovered in 1984 by the facility after completing a volatile organic compounds (VOC) analysis on production well water as required by a NPDES permit renewal. A VOC analysis of the Newman Creek discharge under the NPDES permit, outfall 001, indicated the presence of a number of volatile organic compounds, specifically TCE and TCA. A packed aeration treatment unit (air-stripper) was installed in 1985 to treat contaminated ground water. In 1984, the company was informed by the Ohio EPA that because hazardous waste was placed in the lagoon since the effective date of RCRA, the lagoon is classified as a hazardous waste surface impoundment.

In May 1986, Ekco Housewares was referred to the U.S. EPA

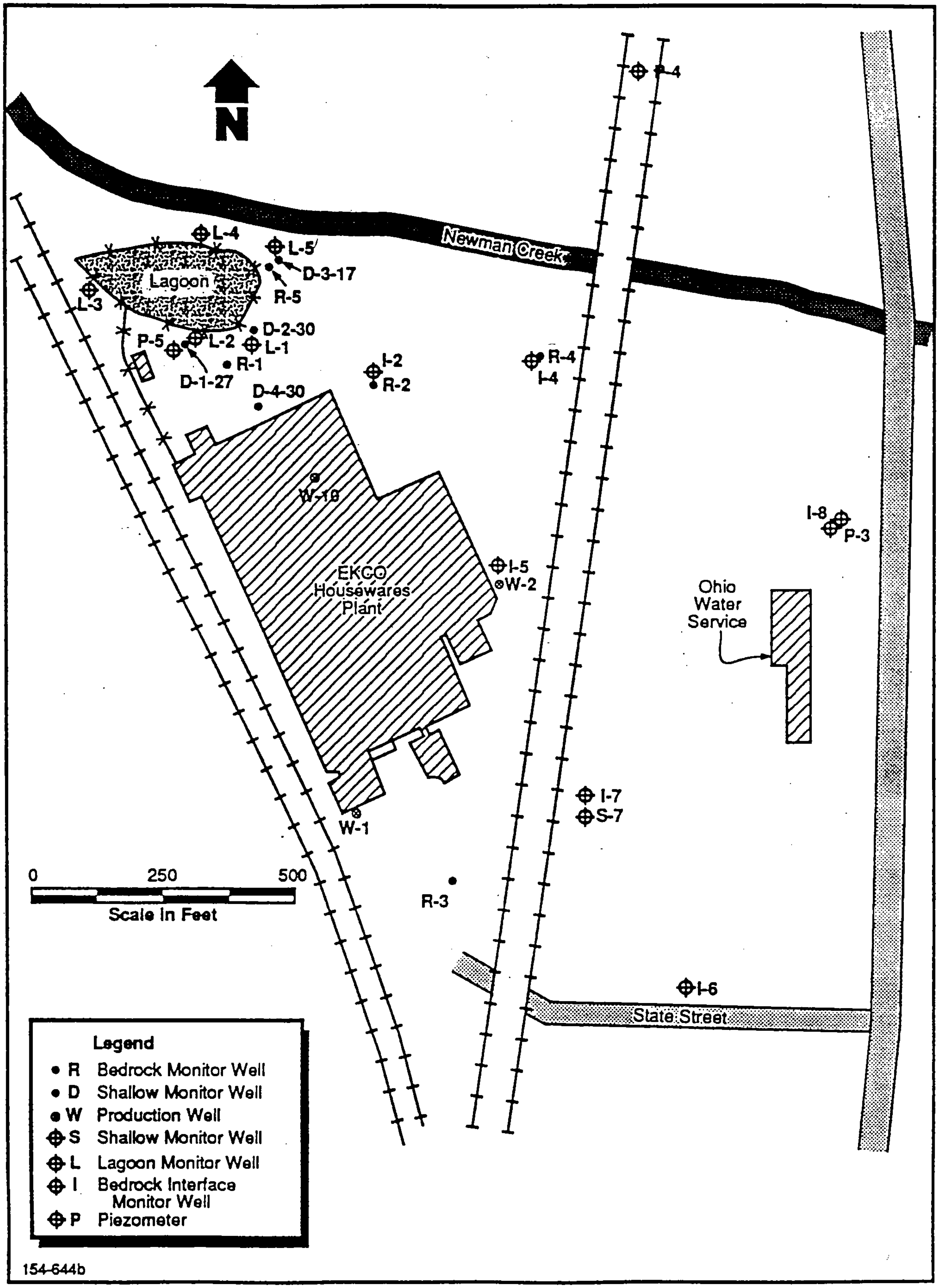

FIGURE 2 WELL LOCATION MAP FOR EKCO HOUSEWARES FACILITY

for enforcement of RCRA violations resulting from operation of a hazardous waste surface impoundment without a permit. In November 1986, the U.S. EPA filed a Complaint, Findings of Violation and Compliance Order against Ekco Housewares that noted violations of RCRA regulations. These violations included all of 40 CFR 265 subpart F. In November 1987, a Partial Consent Agreement and Final Order was filed by the U.S. EPA regarding the Ekco Housewares RCRA violations. A summary of ground water monitoring requirements contained in this document are as follows:

1. Ekco Housewares must develop and submit a plan for a groundwater quality assessment program pursuant to 40 CFR 265.93 within fifty-six days of the effective date of the order.

2. Upon approval and/or modification of the groundwater quality assessment plan by the U.S. EPA, Ekco Housewares shall immediately initiate and complete, according to the schedule of implementation, the activities in the approved plan.

A draft Closure Plan for the surface impoundment and a draft Ground Water Quality Assessment Plan were submitted to the U.S. EPA in January and February 1988, respectively. A draft of the Interim Measures Plan for Recommended Additional Interim Measures was submitted to the U.S. EPA in February, 1988. A revised Ground Water Quality Assessment Plan (GWQAP) was submitted to the U.S. EPA in March 1988 and subsequently was approved by the U.S. EPA with modifications on April 4, 1988. Ekco Housewares is currently implementing the procedures and additional site work as specified in the GWQAP.

On June 27, 1988, a Comprehensive Ground Water Monitoring Evaluation (CME) was completed by the Ohio EPA. As a result of this CME, Ekco Housewares was cited for several violations of the Ohio Administrative Code. These violations are listed below:

1. Ekco Housewares has failed to have at least one monitoring well hydraulically upgradient from the regulated unit (OAC 3745-65-91 (A)(1)).

2. Ekco Housewares has failed to develop and follow a ground water sampling and analysis plan (OAC 3745-65-92(A)).

3. Ekco Housewares has failed to determine the vertical extent of contaminant migration (OAC 3745-65-93(D)(4)(a)).

4. Ekco Housewares has failed to submit an annual report containing the results of the ground water

quality program determining the calculated (or measured) rate of hazardous waste during the reporting period (OAC 3745-65-94(B)(2)).

The Ohio EPA notified Ekco Housewares, in a letter dated July 6, 1988, of the above findings in a Notice of Violations and indicated that these violations should be adequately addressed upon proper implementation of the Ground Water Quality Assessment Plan as conditionally approved by the U.S. EPA in April 1988.

On June 7, 1991, another CME was completed by the Ohio EPA. The following violations were noted:

1. OAC Rule 3745-65-92(A)(2)
The Sampling and Analysis Plan failed to discuss the detection of immiscible layers in the monitoring wells installed at the facility.

2. OAC Rule 3745-65-93(D)(7)(a)
Ekco Housewares had failed to determine the rate and extent of migration and the concentrations of hazardous waste or hazardous waste constituents in the ground water on a quarterly basis.

3. OAC Rule 3745-65-93(D)(4)
Ekco Housewares had failed to determine the rate and extent of migration and concentrations of hazardous waste or hazardous waste constituents in the ground water associated with the management of the hazardous waste surface impoundment.

4. OAC Rule 3745-65-94(B)(2)
Ekco Housewares had failed to annually, until final closure of the facility, submit to the Director a report containing the results of the ground water quality assessment program which includes the concentrations, extent and calculated rate of migration of hazardous waste or hazardous waste constituents in the ground water.

Three deficiencies also were noted in the CME.

Ekco Housewares responded to the CME and the Ohio EPA returned Ekco to compliance in a letter dated October 26, 1992.

A Closure Plan was submitted to the Ohio EPA on August 15, 1988. The plan was found to not meet OAC standards and was disapproved on January 4, 1989, with an effective date of February 6, 1989. An adjudication hearing was requested on February 2, 1989 by Wilkie, Farr, and Gallagher on behalf of Ekco Housewares, Inc. On December 9, 1991, DHWM-NEDO received a revised draft closure plan. The DDAGW recommended disapproval of the December 1991 closure plan in an IOC dated January 27, 1992.

Ekco Housewares subsequently submitted a revised closure plan dated July 1992. The closure plan for the surface impoundment was approved by the Director of the Ohio EPA on July 13, 1993, and work commenced on August 30, 1993. Due to the need to modify the closure plan and inclement weather, Ekco Housewares requested in a letter dated January 4, 1994, to extend the closure period until June 1, 1994. At the time of the CME inspection, the approval of the extension to the closure period is pending.

It should be noted that during a telephone conference between the Ohio EPA and the U.S. EPA Region V on March 18, 1992, it was agreed that the ground water portion of the closure plan would only address potential heavy metal contamination and the issue of volatile organic compound (VOC) contamination would be addressed in the RFI portion of the corrective actions.

The U.S. EPA filed a suit against Ekco Housewares for failing to obtain financial assurance for closure, financial assurance for post-closure, and liability coverage as required by the regulations and a partial consent agreement and order (PCAO) signed November 5, 1986. Upon completion of the trial, the judge ruled on January 28, 1994, that Ekco was guilty and ordered the facility to pay $4,606,000 in a civil penalty.

A 3008 (h) Corrective Action Order was agreed to by Ekco Housewares, Inc. and the U.S. EPA on March 31, 1989 with an order date of April 14, 1989. In this, the facility was ordered to submit to the U.S. EPA a workplan for a RCRA facility investigation (RFI) and a corrective measures study (CMS). This work plan, dated June 1989, was designed to delineate the presence, magnitude, extent, direction and rate of movement of any hazardous waste constituents emanating from the facility within and beyond its boundary. This document refers to the facility in general and not to the surface impoundment specifically.

III. REGIONAL AND SITE HYDROGEOLOGY

Regional Geologic Setting

Stark County lies in two subdivisions of the Appalachian Plateau province. The northern two-thirds of the county lies in the glaciated section of the Appalachian Plateau, and the southern one-third in the unglaciated section (White, 1963). The glacial drift thickness ranges from less than 25 feet to about 100 feet. In the areas of buried valleys however, the unconsolidated material can be as much as 270 feet thick (Schmidt, 1962). Underlying these glacial drift and outwash deposits are sedimentary rocks (sandstone, shale, limestone and coal) of the Pennsylvanian, Mississippian, and Devonian age. Pennsylvanian age deposits consist of the Homewood, Mercer, Massillon and Sharon members of the Pottsville Formation. Mississippian age deposits consist of the Cuyahoga Group and the Berea Sandstone. The Mississippian-Devonian deposits are described as pre-Berea rocks undifferentiated. These bedrock formations dip generally to the southeast at about 20 to 40 feet per mile.

The present drainage pattern of the glaciated section of Stark County is for the most part a direct result of the Wisconsin glaciation. The present Tuscarawas River occupies the valley of the old Dover (Teays Stage) and Newark (Deep Stage) Rivers. A significant erosional level at 900 to 950 feet elevation along the Tuscarawas River Valley represents the Parker Strath of Teays time. Deep entrenchment of the Teays valley is evident from drill records, but owing to the great thickness of the valley fill, few wells penetrate to bedrock, hence knowledge of the gradient of the entrenchment is unknown (White, 1963).

Site Geology and Hydrogeology

The Ekco Housewares facility is located on a western terrace of the Tuscarawas River Valley. Flood control levees now separate the site from the Tuscarawas river and Newman Creek. In 1987, 25 soil borings were advanced across the facility in order to better characterize site geology. This information, supplemented by additional water well and monitoring well drilling logs, indicates that the site directly overlies glacial outwash deposits of interbedded and interlensing clay, silt, silty sand, sand, and gravel. These unconsolidated materials appear to thicken to the east and northeast with thicknesses ranging from a thin veneer near the western property boundary of the plant to 92 feet northeast of the plant. Thick sand and gravel outwash deposits (greater than 250 feet) also are present immediately east of the site. The top-of-bedrock contour map of Stark County indicates that the bedrock surface lies at approximately 950 feet mean sea level southwest of the plant and dips to 900 feet m.s.l. east and northeast of the site. Wells drilled to the bedrock on Ekco Housewares property indicate that the depth to bedrock under the site ranges from a few feet along the western property boundary to approximately 72.5 feet along the eastern property boundary. Adjacent to the site, the depth to bedrock increases to 132 feet at well I-6, located immediately east of the facility, and 108 feet at well P-4, located north of the facility.

The bedrock beneath the outwash deposits consists of interbedded sandstone with shale lenses of 1 to 5 foot thickness belonging to the Pennsylvanian Pottsville Group, probably the Sharon Sandstone member. The thickness of the Sharon Sandstone is reported to be approximately 255 feet (Morningstar, 1922). Available well logs indicate that the shale layers are discontinuous from well to well

The buried valley deposits of sand and gravel and the underlying Pottsville Group are the principle aquifers utilized in the Massillon area. Within a one mile radius of the site, approximately 50 domestic and 5 commercial wells (including W-1, W-2 and W-10 on the Ekco Housewares property) are completed in the Pottsville Group and approximately 6 municipal wells tap the highly permeable sand and gravel deposits within the buried valley. The average depth of the commercial and municipal wells is approximately 225 and 150 feet, respectively.

Although the literature has reported groundwater yields from individual wells installed in the Pottsville Group of only 25 to 100 gallons per minute, Ekco's two on-site production wells collectively withdraw over 400 gallons per minute. However, drilling logs for wells W-1 and W-2 indicate that the sandstone formation was shot with up to 200 pounds of 60% dynamite to fracture the formation and increase well yield. Yields of over 2,000 gallons per minute have been obtained from the local municipal wells completed in the sand and gravel outwash deposits located east and northeast of the site. Calculated values for transmissivity and storativity in the bedrock zone range from 12,000 gpd/foot and 0.0001 to 68,000 gpd/foot and 0.002, respectively (Weston, May 1989).

The existing on-site monitoring wells are completed in both bedrock and unconsolidated glacial material (Figure 2). Water levels in the bedrock monitoring wells range from 22 to 52 feet below the ground surface. The water levels in these wells are affected by the pumping of wells W-1 and W-10. The wells near the lagoon are completed in fill and unconsolidated outwash deposits and have a water table closer to the surface. Water levels from these wells occur at approximate depths of 8 to 21 feet below the ground surface. Ground water elevation data obtained during the 1994 CME inspection (Table 1) was used to generate a potentiometric surface map (Figure 3). Ground water entering beneath the lagoon initially travels in an eastward direction but turns southeast prior to passing from below the lagoon. Historical ground water elevation data collected since the last CME is in Appendix B.

TABLE 1. GROUND WATER ELEVATION DATA COLLECTED DURING THE FEBRUARY 15, 1994, CME INSPECTION

Well	Water level (ft.)	Ground Water Elev. (ft.)	Total well Depth (ft.)
L-1	20.68	926.09	41.46
L-2	17.49	930.59	26.51
L-3	15.25	932.12	20.45
L-4	8.28	930.42	18.35
L-5	7.67	929.79	26.10
R-5	27.61	910.17	54.93

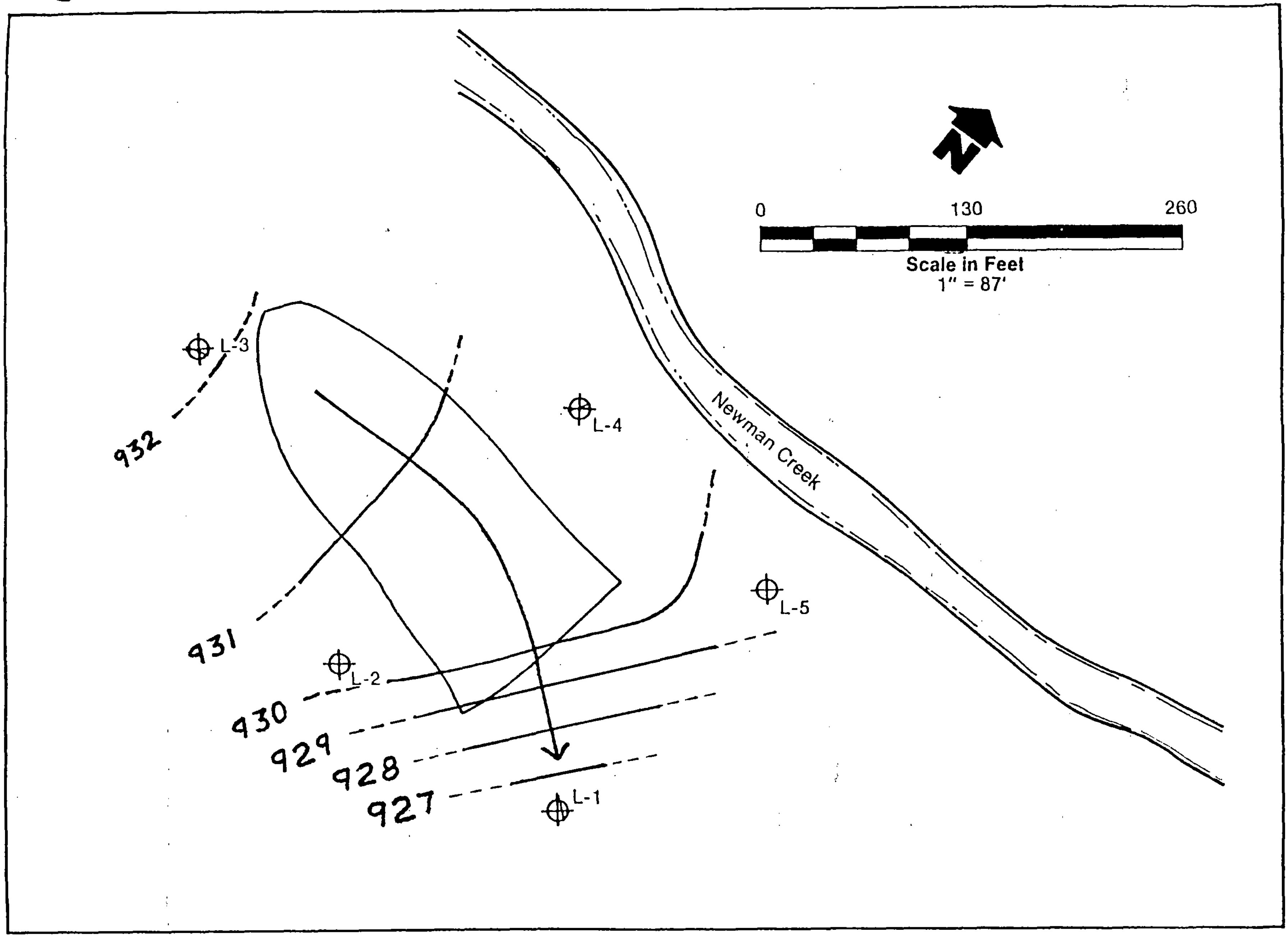

Figure 3. Potentiometric surface map from February 15, 1994. Contouring by Ohio EPA.

The northern property boundary of Ekco lies along Newman Creek, an eastward flowing tributary to the Tuscarawas River. The Tuscarawas River lies approximately 1500 feet east of the facility and flows southward through Massillon. Flood control levees are visible along both water bodies. During the CME inspection considerable debris deposited by high water around monitoring wells L-4 and L-5 indicates that Newman Creek at times experiences very high water levels.

IV. GROUND WATER MONITORING WELL SYSTEM

Ground Water Monitoring History

Several "series" of production and monitoring wells have been installed at the Ekco facility over the years (Figure 2). The W-series are production wells of which two are currently being used by the facility to recover contaminated ground water. Well W-10 is currently being used as a production and recovery well and was installed during the 1940's, however, actual construction details are unknown. Wells W-1 and W-2 were installed in April 1951 to facilitate increased production. Well W-1 is currently being used as a recovery well for ground water contamination. Well W-2 is an out-of-service production well that is currently being used to monitor for ground water contamination. All of the production wells are constructed of 12-inch steel casing and are installed in the Pottsville sandstone. Increased yields for wells W-1 and W-2 were accomplished by fracturing the sandstone with up to 200 pounds of 60% dynamite between 115 and 165 feet below the ground surface. The production wells are not screened and are open boreholes below the unconsolidated outwash deposits.

The R-series bedrock monitoring wells were installed in October 1984 by Ohio Drilling Company to evaluate on-site ground water contamination migration. The wells are installed into the Pottsville sandstone and are cased with six-inch diameter steel pipe through the unconsolidated outwash deposits and left open for the entire length of the boring in the sandstone formation. The cased portions of the wells are not grouted or sealed above the sampling position within the well. All R-series wells have dedicated pumps that are placed in the upper portion of the water table permanently.

Also in October 1984, four test boring holes were completed at the facility to determine potential sources of contamination. Two test borings (P-1-84 and P-2-84) were converted to 1-1/4 inch diameter piezometers with either three or five feet of slotted screen. The piezometers were backfilled with clean gravel, then sealed with bentonite to the surface.

In January 1987 the D-series wells were completed and constructed of 1-1/2 inch PVC casing with 10 or 15 feet of PVC screen. All D-series wells were installed using hollow stem auger drilling methods and continuous soil samples were taken in an 18 or 24 inch split-spoon sampler driven ahead of the auger. All wells were sand packed to two feet above the screen and filled with bentonite pellets and grouted to the surface. Protective outside steel casings with locking caps were placed over the well casings.

During the summer of 1988, 16 new monitoring wells were installed and incorporated into the monitoring network (Weston, May 1989). These wells are discussed below.

<u>Monitoring Well Placement</u>

Figure 2 identifies the locations of all wells at the facility. Weston currently samples the L-series wells and R-5 as part of the monitoring network for the surface impoundment. The locations of these wells were verified during the CME inspection. Well L-3 is located upgradient of the impoundment in compliance with Rule 3745-65-91(A)(1) of the OAC. The remaining wells are located downgradient of the impoundment in compliance with Rule 3745-65-91(A)(2) of the OAC.

<u>Monitoring Well Installation and Construction</u>

Monitoring wells installed since the May 16, 1988, CME inspection date are constructed of either two-inch PVC screens and risers (P-3, P-5), two-inch low carbon steel risers and wire wound type 304 stainless steel screens (P-4), or four-inch wire wound type 304 stainless steel screens and low carbon steel risers (S-7, I- and L-series). Well R-5 has a six-inch low carbon steel riser with no screen. The screen lengths for the remaining wells are 10 feet except for P-5 which has a 5 foot screen. Figure 2 indicates the locations of all well installed at the site. Figure 4 illustrates a typical L-series monitoring well.

The borehole annular space is filled with a silica sand pack to approximately two feet above the top of the screen followed by a two foot plug of sodium bentonite and a grout mixture of bentonite/portland cement to the surface. A protective casing with locking cap was placed over each well and cemented in place. Monitoring well construction information is presented in Table 2.

<u>Monitoring Well Maintenance</u>

An inspection of the L-series wells noted no maintenance problems. However, well R-5 appears to have a cement skirt in need of repair. Since this well is located in an area subject to periodic flooding, proper maintenance of this well is especially important. The cement apron around well R-5 should be inspected

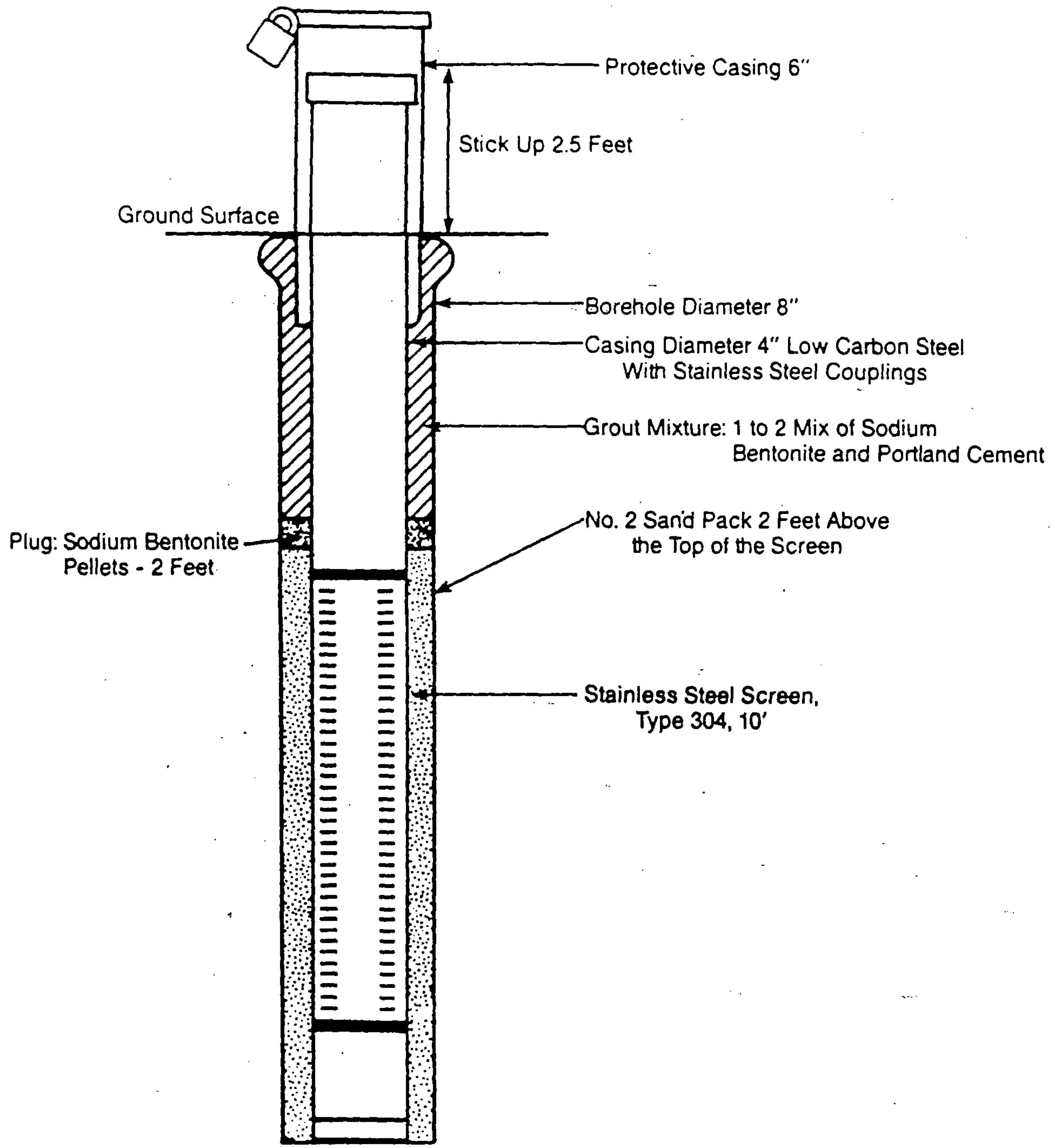

FIGURE 4 SUMMARY SPECIFICATIONS FOR MONITOR WELL COMPLETION

(Weston, 1992b)

Ekco Housewares, Stark Co.

Table 2. Monitoring Well Construction Information

Well #	Grade (AMSL)	Top of Casing (AMSL)	Stickup Calcs.	Boring depth (based on well logs)	Screen Depth (based on well logs)	Screen Elev. (cal.-AMSL)	Screen Length (feet)	Casing Screen diam. and material	Screen Slot Size	Filter Pack	Filter Pack Length	Grout	Drilling Method	Drilling Fluid	Dev. Tech.	Date Installed	Installed By
L-1	944.2	946.77	2.57'	42.0'	32.0'	912.2'	10.0'	4" *	Unk.	Silica Sand	—	Cement bentonite	—	—	—	5-25-88	—
L-2	946.2	948.08	1.88'	34.0'	24.0'	922.2'	10.0'	4" *	Unk.	Silica Sand	—	Cement bentonite	—	—	—	5-17-88	—
L-3	945.98	947.37	1.39'	19.5'	9.5'	936.48'	10.0'	4" *	Unk.	Silica Sand	—	Cement bentonite	—	—	—	5-22-88	—
L-4	936.01	938.70	2.69'	16.0'	6.0'	930.01'	10.0'	4" *	Unk.	Silica Sand	—	Cement bentonite	—	—	—	5-25-88	—
L-5	934.70	937.46	2.76'	29.0'	19.0'	915.70'	10.0'	4" *	Unk.	Silica Sand	—	Cement bentonite	—	—	—	6-30-88	—
R-1	946.0	946.91	0.91'	175'	N/A	N/A	N/A	6"	open hole	N/A	—	—	—	—	—	10-25-84	—
R-2	944.3	946.32	2.02'	179'	N/A	N/A	N/A	6"	open hole	N/A	—	—	—	—	—	10-29-84	—
R-3	945.4	947.14	1.74'	175'	N/A	N/A	N/A	6"	open hole	N/A	—	—	—	—	—	10-[illegible]-84	—
R-4	932.5	933.28	0.78'	165'	N/A	N/A	N/A	6"	open hole	N/A	—	—	—	—	—	7-17-85	—
R-5	934.8	937.78	2.98'	60'	N/A	N/A	N/A	6"	open hole	N/A	—	—	—	—	—	7-23-88	—

Legend:

* Well screens are composed of stainless steel. Well casings are composed of low carbon steel.

N/A = Not Applicable, Unk. = unknown

R- Series wells do not have well screens, Casings composed of low carbon steel and repaired as needed in compliance with Rule 3745-65-91(C) of the OAC.

During the CME inspection it also was noted that well D-3-18 was not locked. A lock was put on this well at the time of the CME inspection. All monitoring wells at the facility should be locked to prevent unauthorized entry.

V. SAMPLING AND ANALYSIS PLAN AND PROCEDURES

Sampling and Analysis Plan Review

The Sampling and Analysis Plan (SAP) includes procedures and techniques for sample collection, sample preservation and shipment, analytical procedures and chain-of-custody control. The SAP is kept on-site at the facility. The SAP reviewed as part of this CME is contained within the facility Closure Plan (Weston, 1992). This document was reviewed by the DDAGW in an IOC to the DHWM dated August 20, 1992, and found to be technically adequate in meeting the ground water monitoring requirements of Rule 3745-65-90 through 3745-65-94 of the OAC as described in Rule 3745-65-92(A) of the OAC.

Currently, Ekco Housewares personnel sample the R-Series wells (R-1 through R-4) on a quarterly basis in February, May, August, and November of each year. Weston personnel also sample the L-series and R-5 wells on a quarterly basis during this same schedule. The Sampling and Analysis Plan and other site-related documents are kept at the facility.

Field Evaluation of Sampling and Analysis Procedures

As part of the CME inspection, the procedures for sampling the L-series and R-5 wells were evaluated. These wells are sampled on a quarterly basis in February, May, August and November of each year by Weston. Ground water surface elevations are first collected from each monitoring well. Dedicated bottom filling bailers are used to both purge and collect samples from each well. Wells are sampled in order of increasing contamination. Temperature, pH, and conductivity also are noted as part of the sampling procedures.

During the sampling event, bailers are lowered into the wells using dedicated rope. A sheet of plastic is placed on the ground to prevent contamination of the sampling equipment or the ground. The VOA bottles are filled first and followed by the field filtration of the samples destined for dissolved metals analysis. Ekco's consultant, Weston, uses disposable, dedicated filtering equipment. Ground water samples were placed in coolers after collection. Purge water is containerized and later fed into the air stripper. In general, the sampling methods observed on February 15, 1994, were conducted according to the facility's Sampling and Analysis Plan in accordance with Rule 3745-65-92(A) of the OAC.

VI. ASSESSMENT MONITORING

Assessment Monitoring Program Description

A ground water quality assessment program for the facility was initiated during the summer of 1988. Ekco Housewares has operated according to an assessment monitoring program during the period of compliance covered by this CME.

Ground Water Quality Assessment Plan/Implementation

The ground water quality assessment program for the Ekco facility was initiated during the summer of 1988. The purpose of the program was to address ground water conditions at the facility proceeding under Section 3008(h) of RCRA, and as part of the closure plan for the surface impoundment. The results of this program are presented in the Groundwater Quality Assessment Report (Weston, 1990). Field activities for the RFI were initiated at the facility in April 1991.

The ground water quality assessment plan adequately meets the minimum plan content requirements of Rule 3745-65-93(D)(3) of the OAC. This plan was implemented as required by Rule 3745-65-93(D)(4) of the OAC. Ground water surface elevations are measured during each quarterly sampling event as required by Rule 3745-65-92(E) of the OAC.

Assessment Monitoring Sampling Events

Assessment sampling events are conducted quarterly on the L-series and R-5 wells in February, May, August and November of each year. The consultant for Ekco Housewares has sampled these wells on a quarterly basis in compliance with rule 3745-65-93(D)(7)(a) of the OAC. Table 3 includes the dates of sampling events at the facility.

TABLE 3. DATES OF SAMPLING EVENTS CONDUCTED SINCE THE PREVIOUS CME INSPECTION

Quarter	1991	1992	1993	1994
L-Series Wells				
First	2-7-91	2-6-92	2-16-93	2-15-94
Second	5-10-91	5-7-92	5-6-93	5-5-94
Third	8-6-91	8-6-92	8-11-93	----
Fourth	11-22-91	11-9-92	11-11-93	----

TABLE 3. DATES OF SAMPLING EVENTS CONDUCTED SINCE THE PREVIOUS CME INSPECTION (continued)

Quarter	1991	1992	1993	1994
R-Series Wells				
First	3-8-91	2-6-92	2-16-93	2-15
Second	6-4-91	5-7-92	5-6-93	----
Third	8-7-91	8-6-92	8-11-93	----
Fourth	11-11-91	11-9-92	11-11-93	----

Ground Water Quality Analytical Results

During a telephone conference between the Ohio EPA and the U.S. EPA Region V on March 18, 1992, it was agreed that the ground water portion of the closure plan would only address potential inorganic contamination and the issue of volatile organic compound (VOC) contamination would be addressed in the RFI portion of the corrective actions.

Table 4 lists inorganic parameters detected during each sampling event. Quarterly ground water data was collected for the interim status monitoring network during the period of compliance as required by Rule 3745-65-93(D)(7)(a) of the OAC. No inorganic analytical parameters exceeded the primary drinking water standards during the period of compliance covered by this CME. The facility appears to have defined the full rate and extent of migration and concentrations of inorganic constituents associated with the impoundment under present site conditions. Numerous organic parameters were detected during each sampling event. However, these parameters are being evaluated by the U.S. EPA and thus are not detailed in this CME.

TABLE 4. INORGANIC PARAMETERS DETECTED DURING QUARTERLY ASSESSMENT SAMPLING EVENTS

Well	Date	Compound	Concentration mg/l	EPA Standard mg/l
L-1 dupl.				
	2-8-91	Arsenic	0.0042	0.05(p)
	11-8-91	Arsenic	0.0023	0.05(p)
	11-10-92	Arsenic	0.0020	0.05(p)
L-1				
	11-10-92	Arsenic	0.0020	0.05(p)
	11-11-93	Arsenic	0.0053	0.05(p)

TABLE 4. INORGANIC PARAMETERS DETECTED DURING QUARTERLY ASSESSMENT SAMPLING EVENTS (continued)

Well	Date	Compound	Concentration mg/l	EPA Standard mg/l
L-2				
	11-8-91	Arsenic	0.0056	0.05(p)
	2-6-92	Arsenic	0.0074	0.05(p)
		Barium	0.063	1.0(p)
L-3				
	11-8-91	Lead	0.0044	0.05(p)
	8-11-93	Barium	0.056	1.0(p)
L-4				
	2-8-91	Arsenic	0.013	0.05(p)
		Barium	0.150	1.0(p)
	5-10-91	Arsenic	0.017	0.05(p)
		Barium	0.16	1.0(p)
	8-6-91	Arsenic	0.018	0.05(p)
	11-8-91	Arsenic	0.020	0.05(p)
		Barium	0.11	1.0(p)
	2-6-92	Arsenic	0.018	0.05(p)
		Barium	0.20	1.0(p)
	5-7-92	Arsenic	0.016	0.05(p)
		Barium	0.17	1.0(p)
	8-7-92	Arsenic	0.015	0.05(p)
		Barium	0.15	1.0(p)
		Selenium	0.0023	0.05(p)
	11-10-92	Arsenic	0.015	0.05(p)
		Barium	0.13	1.0(p)
	2-16-93	Arsenic	0.015	0.05(p)
		Barium	0.150	1.0(p)
	5-6-93	Arsenic	0.014	0.05(p)
		Barium	0.150	1.0(p)
	8-11-93	Arsenic	0.0056	0.05(p)
		Barium	0.100	1.0(p)
	11-11-93	Arsenic	0.016	0.05(p)
		Barium	0.120	1.0(p)
L-5				
	2-8-91	Arsenic	0.0084	0.05(p)
	2-8-91	Barium	0.055	1.0(p)
	5-10-91	Arsenic	0.0078	0.05(p)
		Barium	0.057	1.0(p)
	8-6-91	Arsenic	0.0075	0.05(p)
	11-8-91	Arsenic	0.0064	0.05(p)
		Barium	0.059	1.0(p)
	8-7-92	Arsenic	0.0060	0.05(p)
		Barium	0.055	1.0(p)
	11-10-92	Arsenic	0.011	0.05(p)
		Barium	0.065	1.0(p)

TABLE 4. INORGANIC PARAMETERS DETECTED DURING QUARTERLY ASSESSMENT SAMPLING EVENTS (continued)

Well	Date	Compound	Concentration mg/l	EPA Standard mg/l
L-5				
	8-11-93	Barium	0.050	1.0(p)
	11-11-93	Arsenic	0.0026	0.05(p)
R-5				
	11-8-91	Arsenic	0.0022	0.05(p)
	8-7-92	Arsenic	0.0025	0.05(p)

(p) = Primary Standard

VII. RECORDKEEPING AND REPORTING REQUIREMENTS

Recordkeeping Requirements

Ekco Housewares collects and submits to the Ohio EPA on a regular basis the results of the field collection of ground water samples, ground water surface elevation measurements, potentiometric surface maps and evaluations, and laboratory analytical results. This information is collected in fulfillment of Rules 3745-65-94(A)(1) and 3745-65-94(B)(1) of the OAC, as applicable.

Reporting Requirements

Ekco Housewares is required by Rule 3745-65-75(F) of the OAC to submit by March 1 of each year an annual report detailing the results of the previous year's assessment/detection monitoring program. Table 5 is a list of annual report submittal dates. March 1, 1992, fell on a Sunday, therefore, the 1991 annual report was due on the following day. The facility has submitted all annual reports in compliance with Rule 3745-65-75(F) of the OAC.

TABLE 5. ANNUAL REPORT SUBMITTAL DATES

Year	Date Report Received at Ohio EPA
1991	Mar. 2, 1992
1992	Mar. 1, 1993
1993	Mar. 1, 1994

VIII. COMPLIANCE STATUS SUMMARY

As a result of this CME, no violations of interim status ground water monitoring regulations were noted. However, deficiencies in regards to ground water monitoring regulations, Rules 3745-65-90 through 3745-65-94 of the Ohio Administrative Code, have been identified. Each deficiency is listed below, and a brief corresponding explanation of the nature of the problem is given.

Deficiencies

Deficiency 1. An inspection of the monitoring wells noted a few maintenance deficiencies.

a. The cement apron surrounding well R-5 is starting to crack and appears to be in need of repair. The integrity of the cement apron surrounding this well should be evaluated and repaired as needed.

b. During the CME inspection it also was noted that well D-3-18 was not locked. A lock was put on this well at the time of the CME inspection. All monitoring wells at the facility should be locked to prevent unauthorized entry.

IX. APPENDICES

APPENDIX A

COMPREHENSIVE GROUND-WATER MONITORING EVALUATION WORKSHEET

The following worksheets have been designed to assist the enforcement officer/ technical reviewer in evaluating the ground-water monitoring system an owner/operator uses to collect and analyze samples of ground water. The focus of the worksheets is technical adequacy as it relates to obtaining and analyzing representative samples of ground water. The basis of the worksheets is the final RCRA Ground Water Monitoring Technical Enforcement Guidance Document which describes in detail the aspects of ground-water monitoring which EPA deems essential to meet the goals of RCRA. Appendix A is not a regulatory checklist. Specific technical deficiencies in the monitoring system can, however, be related to the regulations as illustrated in Figure 4.3 taken from the RCRA Ground-Water Monitoring Compliance Order Guide (COG) (included at the end of the appendix). The enforcement officer, in developing an enforcement order, should relate the technical assessment from the worksheets to the regulations using Figure 4.3 from the COG as a guide.

Comprehensive Ground-Water Monitoring Evaluation	Y/N
I. Office Evaluation Technical Evaluation of the Design of the Ground-Water Monitoring System A. Review of Relevant Documents 1. What documents were obtained prior to conducting the inspection: a. RCRA Part A permit application?	N
b. RCRA Part B permit application?	N
c. Correspondence between the owner/operator and appropriate agencies or citizen's groups?	Y
d. Previously conducted facility inspection reports?	Y
e. Facility's contractor reports?	Y
f. Regional hydrogeologic, geologic, or soil reports?	Y
g. The facility's Sampling and Analysis Plan?	Y
h. Ground-water Assessment Program Outline (or Plan, if the facility is in assessment monitoring)?	Y
i. Other (specify) July 1992 RCRA Closure Plan	

	Y/N
B. Evaluation of the Owner/Operator's Hydrogeologic Assessment 1. Did the owner/operator use the following direct techniques in the hydrogeologic assessment:	
a. Logs of the soil borings/rock corings (documented by a professional geologist, soil scientist, or geotechnical engineer)?	Y
b. Materials tests (e.g., grain-size analyses, standard penetration tests, etc.)?	N
c. Piezometer installation for water level measurements at different depths?	Y
d. Slug tests?	N
e. Pump tests?	Y
f. Geochemical analyses of soil samples?	Y
g. Other (specify) (e.g., hydrochemical diagrams and wash analysis)	—
2. Did the owner/operator use the following indirect techniques to supplement direct technique data:	
a. Geophysical well logs?	N
b. Tracer studies?	N
c. Resistivity and/or electromagnetic conductance?	N
d. Seismic Survey?	N
e. Hydraulic conductivity measurements of cores?	N
f. Aerial photography?	N
g. Ground penetrating radar?	N
h. Other (specify)	N
3. Did the owner/operator document and present the raw data from the site hydrogeologic assessment?	Y
4. Did the owner/operator document methods (criteria) used to correlate and analyze the information?	Y
5. Did the owner/operator prepare the following:	Y
a. Narrative description of geology?	Y
b. Geologic cross sections?	Y
c. Geologic and soil maps?	Y
d. Boring/coring logs?	Y
e. Structure contour maps of the differing water bearing zone and confining layers?	Y
f. Narrative description and calculation of ground-water flows?	Y

	Y/N
g. Water table/potentiometric map?	Y
h. Hydrologic cross sections?	Y
6. Did the owner/operator obtain a regional map of the area and delineate the facility?	Y
If yes, does this map illustrate: a. Surficial geology features?	Y
b. Streams, rivers, lakes, or wetlands near the facility?	Y
c. Discharging or recharging wells near the facility?	Y
7. Did the owner/operator obtain a regional hydrogeologic map?	Y
If yes, does this hydrogeologic map indicate: a. Major areas of recharge/discharge?	N
b. Regional ground-water flow direction?	N
c. Potentiometric contours which are consistent with observed water level elevations?	N
8. Did the owner/operator prepare a facility site map?	
If yes, does the site map show: a. Regulated units of the facility (e.g., landfill areas, impoundments)?	Y
b. Any seeps, springs, streams, ponds, or wetlands?	Y
c. Location of monitoring wells, soil borings, or test pits?	Y
d. How many regulated units does the facility have? one	
If more than one regulated unit then, • Does the waste management area encompass all regulated units?	Y
• Is a waste management area delineated for each regulated unit?	Y
C. Characterization of Subsurface Geology of Site 1. Soil boring/test pit program:	
a. Were the soil borings/test pits performed under the supervision of a qualified professional?	Y
b. Did the owner/operator provide documentation for selecting the spacing for borings?	Y
c. Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock?	N/A*
d. Indicate the method(s) of drilling:	

	Y/N
Auger (hollow or solid stem) X Mud rotary ___ Reverse rotary ___ Cable tool X Jetting ___ Other (specify) ___	
e. Were continuous sample corings taken?	Y
f. How were the samples obtained (check method[s]) • Split spoon X • Shelby tube, or similar ___ • Rock coring ___ • Ditch sampling ___ • Other (explain) ___	
g. Were the continuous sample corings logged by a qualified professional in geology?	Y
h. Does the field boring log include the following information: • Hole name/number?	Y
• Date started and finished?	Y
• Driller's name?	Y
• Hole location (i.e., map and elevation)?	Y
• Drill rig type and bit/auger size?	Y
• Gross petrography (e.g., rock type) of each geologic unit?	Y
• Gross mineralogy of each geologic unit?	N
• Gross structural interpretation of each geologic unit and structural features (e.g., fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material)?	N
• Development of soil zones and vertical extent and description of soil type?	Y
• Depth of water bearing unit(s) and vertical extent of each?	Y
• Depth and reason for termination of borehole? Reason not given	Y
• Depth and location of any contaminant encountered in borehole?	Y
• Sample location/number?	Y
• Percent sample recovery?	N
• Narrative descriptions of: —Geologic observations?	Y
—Drilling observations?	Y
i. Were the following analytical tests performed on the core samples: • Mineralogy (e.g., microscopic tests and x-ray diffraction)?	N
• Petrographic analysis: —degree of crystallinity and cementation of matrix?	N
—degree of sorting, size fraction (i.e., sieving), textural variations?	N
—rock type(s)?	N

	Y/N
—soil type?	N
—approximate bulk geochemistry?	N
—existence of microstructures that may effect or indicate fluid flow?	N
• Falling head tests?	N
• Static head tests?	N
• Settling measurements?	N
• Centrifuge tests?	N
• Column drawings?	N
D. Verification of Subsurface Geological Data	
1. Has the owner/operator used indirect geophysical methods to supplement geological conditions between borehole locations?	N
2. Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units?	N
3. Is the confining layer laterally continuous across the entire site?	N/A*
4. Did the owner/operator consider the chemical compatibility of the site-specific waste types and the geologic materials of the confining layer?	N
5. Did the geologic assessment address or provide means for resolution of any information gaps of geologic data?	Y
6. Do the laboratory data corroborate the field data for petrography?	N/A
7. Do the laboratory data corroborate the field data for mineralogy and subsurface geochemistry?	N/A
E. Presentation of Geologic Data	
1. Did the owner/operator present geologic cross sections of the site?	Y
2. Do cross sections:	
a. identify the types and characteristics of the geologic materials present?	Y
b. define the contact zones between different geologic materials?	Y
c. note the zones of high permeability or fracture?	N
d. give detailed borehole information including:	

	Y/N
• location of borehole?	Y
• depth of termination?	Y
• location of screen (if applicable)?	Y
• depth of zone(s) of saturation?	Y
• backfill procedure?	Y
3. Did the owner/operator provide a topographic map which was constructed by a licensed surveyor?	N
4. Does the topographic map provide: a. contours at a maximum interval of two-feet?	N *
b. locations and illustrations of man-made features (e.g., parking lots, factory buildings, drainage ditches, storm drain, pipelines, etc.)?	Y
c. descriptions of nearby water bodies?	Y
d. descriptions of off-site wells?	Y
e. site boundaries?	Y
f. individual RCRA units?	Y
g. delineation of the waste management area(s)?	Y
h. well and boring locations?	Y
5. Did the owner/operator provide an aerial photograph depicting the site and adjacent off-site features?	N
6. Does the photograph clearly show surface water bodies, adjacent municipalities, and residences and are these clearly labelled?	N/A
F. Identification of Ground-Water Flowpaths 1. Ground-water flow direction a. Was the well casing height measured by a licensed surveyor to the nearest 0.01 foot?	Y
b. Were the well water level measurements taken within a 24 hour period?	Y
c. Were the well water level measurements taken to the nearest 0.01 foot?	Y
d. Were the well water levels allowed to stabilize after construction and development for a minimum of 24 hours prior to measurements?	Y
e. Was the water level information obtained from (check appropriate one): • multiple piezometers placed in single borehole? ____ • vertically nested piezometers in closely spaced separate boreholes? ____ • monitoring wells? X	

	Y/N
f. Did the owner/operator provide construction details for the piezometers?	Y
g. How were the static water levels measured (check method[s]). • Electric water sounder X • Wetted tape ____ • Air line ____ • Other (explain) ____	
h. Was the well water level measured in wells with equivalent screened intervals at an equivalent depth below the saturated zone?	Y
i. Has the owner/operator provided a site water table (potentiometric) contour map?	Y
If yes, • Do the potentiometric contours appear logical and accurate based on topography and presented data? (Consult water level data)	Y
• Are ground-water flow-lines indicated?	N
• Are static water levels shown?	Y
• Can hydraulic gradients be estimated?	Y
j. Did the owner/operator develop hydrologic cross sections of the vertical flow component across the site using measurements from all wells?	N
k. Do the owner/operator's flow nets include: • piezometer locations?	Y
• depth of screening?	N
• width of screening?	N
• measurements of water levels from all wells and piezometers?	Y
2. Seasonal and temporal fluctuations in ground-water a. Do fluctuations in static water levels occur? If yes, are the fluctuations caused by any of the following:	Y
—Off-site well pumping	NS *
—Tidal processes or other intermittent natural variations (e.g., river stage, etc.)	Y
—On-site well pumping	Y
—Off-site, on-site construction or changing land use patterns	NS
—Deep well injection	N
—Seasonal variations	Y
—Other (specify) ____	
b. Has the owner/operator documented sources and patterns that contribute to or affect the ground-water patterns below the waste management area?	Y
c. Do water level fluctuations alter the general ground-water gradients and flow directions?	Y
d. Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone?	NS

	Y/N
e. Did the owner/operator implement means for gauging long term effects on water movement that may result from on-site or off-site construction or changes in land-use patterns?	Y
3. Hydraulic conductivity a. How were hydraulic conductivities of the subsurface materials determined?	
• Single-well tests (slug tests)?	N
• Multiple-well tests (pump tests)	Y
• Other (specify) ________	
b. If single-well tests were conducted, were they done by: • Adding or removing a known volume of water?	N/A
• Pressurizing well casing?	N/A
c. If single well tests were conducted in a highly permeable formation, were pressure transducers and high-speed recording equipment used to record the rapidly changing water levels?	N/A
d. Since single well tests only measure hydraulic conductivity in a limited area, were enough tests run to ensure a representative measure of conductivity in each hydrogeologic unit?	N/A
e. Are the owner/operator's slug test data (if applicable) consistent with existing geologic information (e.g., boring logs)?	N/A
f. Were other hydraulic conductivity properties determined?	N
g. If yes, provide any of the following data, if available: • Transmissivity 12,000 to 68,000 gpd/ft (R-wells) • Storage coefficient 0.0001 to 0.002 (R-wells) • Leakage ____ • Permeability ____ • Porosity ____ • Specific capacity ____ • Other (specify) ________	
4. Identification of the uppermost aquifer a. Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined? If yes,	Y
• Are soil boring/test pit logs included?	Y
• Are geologic cross-sections included?	Y
b. Is there evidence of confining (competent, unfractured, continuous, and low permeability) layers beneath the site? If yes,	N
• how was continuity demonstrated? ________	
c. What is the hydraulic conductivity of the confining unit? (cm/sec.)	N/A
d. How was it determined?	N/A

	Y/N
e. Does potential for other hydraulic communication exist (e.g., lateral discontinuity between geologic units, facies changes, fracture zones, cross cutting structures, or chemical corrosion/alteration of geologic units by leachate)? If yes or no, what is the rationale? Interbedding of Fill material, sand and gravel, silt and sandstone bedrock	Y
G. Office Evaluation of the Facility's Ground-Water Monitoring System—Monitoring Well Design and Construction: These questions should be answered for each different well design present at the facility. 1. Drilling Methods a. What drilling method was used for the well? • Hollow-stem auger ☒ • Solid-stem auger ☐ • Mud rotary (water) ☐ • Air rotary ☐ • Reverse rotary ☐ • Cable tool ☒ • Jetting ☐ • Air drill w/ casing hammer ☐ • Other (specify) ______	
b. Were any cutting fluids (including water) or additives used during drilling? If yes, specify: • Type of drilling fluid ______ • Source of water used Formation water • Foam ______ • Polymers ______ • Other ______	N
c. Was the cutting fluid, or additive, identified?	N/A
d. Was the drilling equipment steam-cleaned prior to drilling the well? • Other methods ______	Y
e. Was compressed air used during drilling? If yes, • was the air filtered to remove oil?	N
f. Did the owner/operator document procedure for establishing the potentiometric surface? If yes, • how was the location established?	Y *
g. Formation samples	

	Y/N
• Were formation samples collected initially during drilling?	Y
• Were any cores taken continuously?	Y *
• If not, at what interval were samples taken?	*
• How were the samples obtained? X Split spoon —Shelby tube —Core drill —Other (specify)	
• Identify if any physical and/or chemical tests were performed on the formation samples (specify) HNU organic vapor meter, Blow counts, Field determination of grain size, color, texture and any contamination	
2. Monitoring Well Construction Materials a. Identify construction materials (by number) and diameters (ID/OD) Material / Diameter • Primary Casing: low Carbon steel / 6" & 4" ID. or 2" PVC • Secondary or outside casing (double construction): ____ / ____ • Screen: Stainless Steel / 4" ID. or 2" PVC	
b. How are the sections of casing and screen connected? • Pipe sections threaded	Threaded
• Couplings (friction) with adhesive or solvent	
• Couplings (friction) with retainer screws	
• Other (specify)	
c. Were the materials steam-cleaned prior to installation? • If no, how were the materials cleaned? ______	Y
3. Well Intake Design and Well Development a. Was a well intake screen installed?	Y
• What is the length of the screen for the well? R-series wells are open borehole in bedrock	10 ft.
• Is the screen manufactured?	Y
b. Was a filter pack installed?	Y
• What kind of filter pack was employed? no. 2 sand	
• Is the filter pack compatible with formation materials?	Y
• How was the filter pack installed? Poured in	

	Y/N
• What are the dimensions of the filter pack? 8 inch by approximately 12 feet depending on well	
• Has a turbidity measurement of the well water ever been made?	N
• Have the filter pack and screen been designed for the in-situ materials?	Y
c. Well development • Was the well developed?	Y
• What technique was used for well development? —Surge block X Bailer X Air surging X Water pumping —Other (specify)	
4. Annular Space Seals a. What is the annular space in the saturated zone directly above the filter pack filled with: X Sodium bentonite (specify type and grit) (Pellets) —Cement (specify neat or concrete) —Other (specify)	
b. Was the seal installed by: —Dropping material down the hole and tamping —Dropping material down the inside of hollow-stem auger —Tremie pipe method —Other (specify)	NS
c. Was a different seal used in the unsaturated zone? If yes,	Y
• Was this seal made with? Grout mixture of X Sodium bentonite (specify type and grit) bentonite and X Cement (specify neat or concrete)- Other (specify) Portland Cement	
• Was this seal installed by? —Dropping material down the hole and tamping —Dropping material down the inside of hollow stem auger —Other (specify)	NS
d. Is the upper portion of the borehole sealed with a concrete cap to prevent infiltration from the surface?	Y
e. Is the well fitted with an above-ground protective device and bumper guards?	Y
f. Has the protective cover been installed with locks to prevent tampering?	Y

	Y/N
H. Evaluation of the Facility's Detection Monitoring Program	
1. Placement of Downgradient Detection Monitoring Wells	
a. Are the ground-water monitoring wells or clusters located immediately adjacent to the waste management area?	Y
b. How far apart are the detection monitoring wells?	*
c. Does the owner/operator provide a rationale for the location of each monitoring well or cluster?	Y
d. Does the owner/operator identify the well screen lengths of each monitoring well or cluster?	Y
e. Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster?	N
f. Do the actual locations of monitoring wells or clusters correspond to those identified by the owner/operator?	Y
2. Placement of Upgradient Monitoring Wells	
a. Has the owner/operator documented the location of each upgradient monitoring well or cluster?	Y
b. Does the owner/operator provide an explanation for the location(s) of the upgradient monitoring wells?	Y
c. What length screen has the owner/operator employed in the background monitoring well(s)?	10 ft.
d. Does the owner/operator provide an explanation for the screen length(s) chosen?	N
e. Does the actual location of each background monitoring well or cluster correspond to that identified by the owner/operator?	Y
I. Office Evaluation of the Facility's Assessment Monitoring Program	
1. Does the assessment plan specify:	
a. The number, location, and depth of wells?	Y
b. The rationale for their placement and identify the basis that will be used to select subsequent sampling locations and depths in later assessment phases?	Y
2. Does the list of monitoring parameters include all hazardous waste constituents from the facility?	Y

	Y/N
a. Does the water quality parameter list include other important indicators not classified as hazardous waste constituents?	Y
b. Does the owner/operator provide documentation for the listed wastes which are not included?	N/A
3. Does the owner/operator's assessment plan specify the procedures to be used to determine the rate of constituent migration in the ground-water?	Y
4. Has the owner/operator specified a schedule of implementation in the assessment plan?	Y
5. Have the assessment monitoring objectives been clearly defined in the assessment plan?	Y
a. Does the plan include analysis and/or re-evaluation to determine if significant contamination has occurred in any of the detection monitoring wells?	N/A
b. Does the plan provide for a comprehensive program of investigation to fully characterize the rate and extent of contaminant migration from the facility?	Y
c. Does the plan call for determining the concentrations of hazardous wastes and hazardous waste constituents in the ground water?	Y
d. Does the plan employ a quarterly monitoring program?	Y
6. Does the assessment plan identify the investigatory methods that will be used in the assessment phase?	Y
a. Is the role of each method in the evaluation fully described?	Y
b. Does the plan provide sufficient descriptions of the direct methods to be used?	Y
c. Does the plan provide sufficient descriptions of the indirect methods to be used?	N
d. Will the method contribute to the further characterization of the contaminant movement?	Y
7. Are the investigatory techniques utilized in the assessment program based on direct methods?	Y
a. Does the assessment approach incorporate indirect methods to further support direct methods?	N
b. Will the planned methods called for in the assessment approach ultimately meet performance standards for assessment monitoring?	Y
c. Are the procedures well defined?	Y
d. Does the approach provide for monitoring wells similar in design and construction as the detection monitoring wells?	Y

	Y/N
e. Does the approach employ taking samples during drilling or collecting core samples for further analysis?	Y
8. Are the indirect methods to be used based on reliable and accepted geophysical techniques?	
a. Are they capable of detecting subsurface changes resulting from contaminant migration at the site?	N/A
b. Is the measurement at an appropriate level of sensitivity to detect ground-water quality changes at the site?	N/A
c. Is the method appropriate considering the nature of the subsurface materials?	N/A
d. Does the approach consider the limitations of these methods?	N/A
e. Will the extent of contamination and constituent concentration be based on direct methods and sound engineering judgment? (Using indirect methods to substantiate the findings.)	N/A
9. Does the assessment approach incorporate any mathematical modeling to predict contaminant movement?	Y
a. Will site specific measurements be utilized to accurately portray the subsurface?	Y
b. Will the derived data be reliable?	Y *
c. Have the assumptions been identified?	Y
d. Have the physical and chemical properties of the site specific wastes and hazardous waste constituents been identified?	Y
J. Conclusions	
1. Subsurface geology	
a. Have sufficient data been collected to adequately define petrography and petrographic variation?	Y
b. Has the subsurface geochemistry been adequately defined?	N
c. Was the boring/coring program adequate to define subsurface geologic variation?	Y
d. Was the owner/operator's narrative description complete and accurate in its interpretation of the data?	Y
e. Does the geologic assessment address or provide means to resolve any information gaps?	Y
2. Ground-water flowpaths	
a. Did the owner/operator adequately establish the horizontal and vertical components of ground water flow?	Y

	Y/N
b. Were appropriate methods used to establish ground-water flowpaths?	Y
c. Did the owner/operator provide accurate documentation?	Y
d. Are the potentiometric surface measurements valid?	Y
e. Did the owner/operator adequately consider the seasonal and temporal effects on the ground-water?	Y
f. Were sufficient hydraulic conductivity tests performed to document lateral and vertical variation in hydraulic conductivity in the entire hydrogeologic subsurface below the site?	Y
3. Uppermost Aquifer a. Did the owner/operator adequately define the upper-most aquifer?	Y
4. Monitoring Well Construction and Design a. Do the design and construction of the owner/operator's ground-water monitoring wells permit depth discrete ground-water samples to be taken?	Y
b. Are the samples representative of ground-water quality?	Y
c. Are the ground-water monitoring wells structurally stable?	Y
d. Does the ground-water monitoring well's design and construction permit an accurate assessment of aquifer characteristics?	Y
5. Detection Monitoring a. Downgradient Wells • Do the location, and screen lengths of the ground-water monitoring wells or clusters in the detection monitoring system allow the immediate detection of a release of hazardous waste or constituents from the hazardous waste management area to the uppermost aquifer?	Y
b. Upgradient Wells • Do the location and screen lengths of the upgradient (background) ground-water monitoring wells ensure the capability of collecting ground-water samples representative of upgradient (background) ground-water quality including any ambient heterogenous chemical characteristics?	Y
6. Assessment Monitoring a. Has the owner/operator adequately characterized site hydrogeology to determine contaminant migration?	Y
b. Is the detection monitoring system adequately designed and constructed to immediately detect any contaminant release?	Y

	Y/N
c. Are the procedures used to make a first determination of contamination adequate?	Y
d. Is the assessment plan adequate to detect, characterize, and track contaminant migration?	Y
e. Will the assessment monitoring wells, given site hydrogeologic conditions, define the extent and concentration of contamination in the horizontal and vertical planes?	Y
f. Are the assessment monitoring wells adequately designed and constructed?	Y
g. Are the sampling and analysis procedures adequate to provide a true measurement of contamination?	Y
h. Do the procedures used for evaluation of assessment monitoring data result in determinations of the rate of migration, extent of migration, and hazardous constituent composition of the contaminant plume?	Y
i. Are the data collected at sufficient frequency and duration to adequately determine the rate of migration?	Y
j. Is the schedule of implementation adequate?	Y
k. Is the owner/operator's assessment monitoring plan adequate?	Y
• If the owner/operator had to implement his assessment monitoring plan was it implemented satisfactorily?	Y
II. Field Evaluation **A. Ground-Water Monitoring System** 1. Are the numbers, depths, and locations of monitoring wells in agreement with those reported in the facility's monitoring plan? (See Section 3.2.3.)	Y
B. Monitoring Well Construction 1. Identify construction material material diameter a. Primary Casing 4" ID low carbon steel b. Secondary or outside casing ______	
2. Is the upper portion of the borehole sealed with concrete to prevent infiltration from the surface?	Y *
3. Is the well fitted with an above-ground protective device?	Y
4. Is the protective cover fitted with locks to prevent tampering? If a facility utilizes more than a single well design, answer the above questions for each well design?	Y

	Y/N
III. Review of Sample Collection Procedures	
A. Measurement of Well Depths /Elevation	
1. Are measurements of both depth to standing water and depth to the bottom of the well made?	Y
2. Are measurements taken to the 0.01 foot?	Y
3. What device is used? Electric Sounding Device	
4. Is there a reference point established by a licensed surveyor?	Y
5. Is the measuring equipment properly cleaned between well locations to prevent cross contamination?	Y
B. Detection of Immiscible Layers	
1. Are procedures used which will detect light phase immiscible layers?	Y
2. Are procedures used which will detect heavy phase immiscible layers?	N
C. Sampling of Immiscible Layers	
1. Are the immiscible layers sampled separately prior to well evacuation?	N
2. Do the procedures used minimize mixing with water soluble phases?	N
D. Well Evacuation	
1. Are low yielding wells evacuated to dryness?	Y
2. Are high yielding wells evacuated so that at least three casing volumes are removed?	Y
3. What device is used to evacuate the wells?	*
4. If any problems are encountered (e.g., equipment malfunction) are they noted in a field logbook?	Y

	Y/N
E. Sample Withdrawal	
1. For low yielding wells, are samples for volatiles, pH, and oxidation/reduction potential drawn first after the well recovers?	Y
2. Are samples withdrawn wit: either flurocarbon/resins or stainless steel (316, 304 or 2205) sampling devices?	Y
3. Are sampling devices either bottom valve bailers or positive gas displacement bladder pumps?	Y
4. If bailers are used, is fluorocarbon/resin coated wire, single strand stainless steel wire, or monofilament used to raise and lower the bailer?	N *
5. If bladder pumps are used, are they operated in a continuous manner to prevent aeration of the sample?	N/A
6. If bailers are used, are they lowered slowly to prevent degassing of the water?	Y
7. If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration?	Y
8. Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior to insertion into the well?	Y
9. If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned between samples?	N/A
10. If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps: a. Nonphosphate detergent wash? b. Dilute acid rinse (HNO_3 or HCl)? c. Tap water rinse? d. Type II reagent grade water?	N *
11. If samples are for organic analysis, does the cleaning procedure include the following sequential steps: a. Nonphosphate detergent wash?	N *
b. Tap water rinse?	N
c. Distilled/deionized water rinse?	N
d. Acetone rinse?	N
e. Pesticide-grade hexane rinse?	N

	Y/N
12. Is sampling equipment thoroughly dry before use?	Y
13. Are equipment blanks taken to ensure that sample cross-contamination has not occurred?	N *
14. If volatile samples are taken with a positive gas displacement bladder pump, are pumping rates below 100 ml/min?	N/A
F. In-situ or Field Analyses	
1. Are the following labile (chemically unstable) parameters determined in the field:	
a. pH?	Y
b. Temperature?	Y
c. Specific conductivity?	Y
d. Redox potential?	N
e. Chlorine?	N
f. Dissolved oxygen?	N
g. Turbidity?	N
h. Other (specify) ____________	N
2. For in-situ determinations, are they made after well evacuation and sample removal?	N/A
3. If sample is withdrawn from the well, is parameter measured from a split portion?	N *
4. Are monitoring equipment calibrated according to manufacturer's specifications and consistent with SW-846?	Y
5. Are the date, procedure, and maintenance for equipment calibration documented in the field logbook?	Y
IV. Review of Sample Preservation and Handling Procedures	
A. Sample Containers	
1. Are samples transferred from the sampling device directly to their compatible containers?	Y *

	Y/N
2. Are sample containers for metals (inorganics) analyses polyethylene with polypropylene caps?	Y
3. Are sample containers for organics analysis glass bottles with fluorocarbonresin-lined caps?	Y
4. If glass bottles are used for metals samples are the caps fluorocarbonresin-lined?	N/A
5. Are the sample containers for metal analyses cleaned using these sequential steps:	
a. Nonphosphate detergent wash?	N/A *
b. 1:1 nitric acid rinse?	N/A
c. Tap water rinse?	N/A
d. 1:1 hydrochloric acid rinse?	N/A
e. Tap water rinse?	N/A
f. Distilled/deionized water rinse?	N/A
6. Are the sample containers for organic analyses cleaned using these sequential steps:	
a. Nonphosphate detergent/hot water wash?	NS *
b. Tap water rinse?	NS
c. Distilled/deionized water rinse?	NS
d. Acetone rinse?	NS
e. Pesticide-grade hexane rinse?	NS
7. Are trip blanks used for each sample container type to verify cleanliness?	Y
B. Sample Preservation Procedures	
1. Are samples for the following analyses cooled to 4°C:	
a. TOC?	N/A
b. TOX?	N/A
c. Chloride?	N/A
d. Phenols?	N/A
e. Sulfate?	N/A
f. Nitrate?	N/A
g. Coliform bacteria?	N/A
h. Cyanide?	N/A
i. Oil and grease?	N/A
j. Hazardous constituents (261, Appendix VIII)	Y

	Y/N
2. Are samples for the following analyses field acidified to pH <2 with HNO_3:	
a. Iron?	Y
b. Manganese?	Y
c. Sodium?	Y
d. Total metals?	N/A
e. Dissolved metals?	Y
f. Fluoride?	N/A
g. Endrin?	N/A
h. Lindane?	N/A
i. Methoxychlor?	N/A
j. Toxaphene?	N/A
k. 2,4, D?	N/A
l. 2,4,5 TP Silvex?	N/A
m. Radium?	N/A
n. Gross alpha?	N/A
o. Gross beta?	N/A
3. Are samples for the following analyses field acidified to pH <2 with H_2SO_4:	
a. Phenols?	N/A
b. Oil and grease?	N/A
4. Is the sample for TOC analysis field acidified to pH <2 with HCl?	N/A
5. Is the sample for TOX analysis preserved with 1 ml of 1.1 M sodium sulfite?	N/A
6. Is the sample for cyanide analysis preserved with NaOH to pH >12?	N/A
C. Special Handling Considerations	
1. Are organic samples handled without filtering?	Y
2. Are samples for volatile organics transfered to the appropriate vials to eliminate headspace over the sample?	Y
3. Are samples for metal analysis split into two portions?	N
4. Is the sample for dissolved metals filtered through a 0.45 micron filter?	Y
5. Is the second portion not filtered and analyzed for total metals?	N/A
6. Is one equipment blank prepared each day of ground-water sampling?	N

	Y/N
V. Review of Chain-of-Custody Procedures	
A. Sample Labels	
1. Are sample labels used?	Y
2. Do they provide the following information:	
a. Sample identification number?	Y
b. Name of collector?	Y
c. Date and time of collection?	Y
d. Place of collection?	Y
e. Parameter(s) requested and preservatives used?	Y
3. Do they remain legible even if wet?	Y
B. Sample Seals	
1. Are sample seals placed on those containers to ensure samples are not altered?	NS
C. Field Logbook	
1. Is a field logbook maintained?	Y
2. Does it document the following:	
a. Purpose of sampling (e.g., detection or assessment)?	Y
b. Location of well(s)?	Y
c. Total depth of each well?	Y
d. Static water level depth and measurement technique?	Y
e. Presence of immiscible layers and detection method?	N
f. Collection method for immiscible layers and sample identification numbers?	N
g. Well evacuation procedures?	Y
h. Sample withdrawal procedure?	Y
i. Date and time of collection?	Y
j. Well sampling sequence?	Y
k. Types of sample containers and sample identification number(s)?	Y
l. Preservative(s) used?	Y
m. Parameters requested?	Y
n. Field analysis data and method(s)?	Y
o. Sample distribution and transporter?	Y
p. Field observations?	Y

	Y/N
—Unusual well recharge rates?	Y
—Equipment malfunction(s)?	Y
—Possible sample contamination?	Y
—Sampling rate?	Y
D. Chain-of-Custody Record	
1. Is a chain-of-custody record included with each sample?	Y
2. Does it document the following:	
a. Sample number?	Y
b. Signature of collector?	Y
c. Date and time of collection?	Y
d. Sample type?	Y
e. Station location?	Y
f. Number of containers?	Y
g. Parameters requested?	Y
h. Signatures of persons involved in chain-of-custody?	Y
i. Inclusive dates of custody?	Y
E. Sample Analysis Request Sheet	
1. Does a sample analysis request sheet accompany each sample?	Y *
2. Does the request sheet document the following:	
a. Name of person receiving the sample?	Y
b. Date of sample receipt?	Y
c. Duplicates?	NS
d. Analysis to be performed?	Y
VI. Review of Quality Assurance/Quality Control	
A. Is the validity and reliability of the laboratory and field generated data ensured by a QA/QC program?	Y
B. Does the QA/QC program include:	
1. Documentation of any deviation from approved procedures?	Y

	Y/N
2. Documentation of analytical results for:	
a. Blanks?	Y
b. Standards?	Y
c. Duplicates?	Y
d. Spiked samples?	Y
e. Detectable limits for each parameter being analyzed?	Y
C. Are approved statistical methods used?	Y
D. Are QC samples used to correct data?	Y
E. Is all data critically examined to ensure it has been properly calculated and reported?	Y
VII. Surficial Well Inspection and Field Observation	
A. Are the wells adequately maintained?	N*
B. Are the monitoring wells protected and secure?	N*
C. Do the wells have surveyed casing elevations?	Y
D. Are the ground-water samples turbid?	N
E. Have all physical characteristics of the site been noted in the inspector's field notes (i.e., surface waters, topography, surface features)?	Y
F. Has a site sketch been prepared by the field inspector with scale, north arrow, location(s) of buildings, location(s) of regulated units, locations of monitoring wells, and a rough depiction of the site drainage pattern?	N

	Y/N
VIII. Conclusions	
A. Is the facility currently operating under the correct monitoring program according to the statistical analyses performed by the current operator?	Y
B. Does the ground-water monitoring system, as designed and operated, allow for detection or assessment of any possible ground-water contamination caused by the facility?	Y
C. Does the sampling and analysis procedure permit the owner/operator to detect and, where possible, assess the nature and extent of a release of hazardous constituents to ground water from the monitored hazardous waste management facility?	Y

CHECKLIST A - ADDENDUM AND COMMENTS

I.C.1.c. A confining unit has not been identified below the site.

I.D.3. A confining unit has not been identified below the site.

I.E.4. Various site maps prepared by the consultant provide all this information except for topographic contour lines at a two-foot maximum interval.

I.F.2.a. City water supply production wells are operating near the facility and may have an effect on the elevation of the water table under the site.

I.G.1.f. Wells were developed by bailing, air lifting, and pumping. The water levels were measured after the wells recovered.

I.G.1.g. Split spoon samples were collected at five-foot intervals from wells drilled by hollow stem augers. Cable tool drilling methods do not allow for this type of sample collection.

I.H.1.b. The L-series wells surrounding the lagoon are located from approximately 145 feet apart up to a maximum distance of approximately 365 feet apart.

I.I.9.b. The modflow ground water model is based on several assumptions and calibration. Model input parameters must be evaluated to properly use the proposed model. If properly followed, modflow yields acceptable results. The U.S. EPA is coordinating the completion and use of the ground water flow model during the RFI/CMS process.

II.B.2. The cement apron surrounding well R-5 appears to be in need of repair and should be evaluated and repaired as needed.

II.D.3. The monitoring wells are evacuated using a bailer except for wells L-5 and R-5 which are evacuated using a submersible pump due to their larger well volumes.

III.E.4. Dedicated bailers and rope are used to purge and sample each well.

III.E.10. Samples destined for metals analyses are filtered with dedicated, disposable filters after being withdrawn using dedicated bailers.

III.E.11. Dedicated sample withdrawal equipment is used to obtain samples for organic analyses.

III.E.13. Equipment blanks are not needed because dedicated bailers and disposable filters are used.

III.F.3. The consultant used purge water from the well to obtain measurements of pH and specific conductivity.

IV.A.1. Samples destined for metals analyses first are transferred to a disposable container for filtering.

IV.A.5. Disposable filters and containers are used to hold samples destined for metals analyses.

IV.A.6. The VOA bottles used to collect samples for organic analyses are provided by the laboratory. The decontamination process used by the laboratory is unknown.

V.E.1. The requested analyses are included on the chain-of-custody form.

VII.A. The cement apron surrounding well R-5 appears to be in need of repair and should be evaluated and repaired as needed.

VII.B. All monitoring wells at the facility should be locked to prevent unauthorized access.

APPENDIX A-1

FACILITY INSPECTION FORM FOR COMPLIANCE WITH INTERIM STATUS STANDARDS COVERING GROUND-WATER

Company: Ekco Housewares EPA I.D. Number: 045 205 424

Company Address: 359 State Ave., NW, P.O. Box 560, Massillon OH, 44648

Company Contact/Official: Paul Tag Title: Plant Manager

Date of Inspection: Feb 15, 94

Inspector's Name: Rich Kurlich Branch/Organization: OEPA - NEDO

Type of Facility: (check appropriately)	Y/N
a) surface impoundment	Y
b) landfill	N
c) land treatment facility	N
Ground Water Monitoring Program	
1. Has a ground water monitoring plan been submitted to the Director for facilities containing a surface impoundment, landfill, land treatment facility?	Y
2. Was the ground water monitoring plan reviewed prior to the site visit? If "No," explain.	Y
A. Was the ground water plan reviewed at the facility prior to the actual site inspection? If "No," explain.	Y
3. Has a ground water monitoring program (capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility) been implemented? 3745-65-90(A)	Y
4. Has at least one monitoring well been installed in the uppermost aquifer hydraulically upgradient from the limit of the waste management area? 3745-65-91(A)(1)	Y
A. Are sufficient ground water samples from the uppermost aquifer, representative of background ground water quality and not affected by the facility, ensured by proper well	
1) Number(s)?	Y
2) Location?	Y
3) Depth?	Y

Y - YES, N - NO, NA - NOT APPLICABLE
NS - NOT SPECIFIED * - COMMENT

APPENDIX A-1	Y/N
5. Have at least three monitoring wells been installed hydraulically downgradient at the limit of the waste handling or management area? 3745-65-91(A)(2)	Y
6. Have the locations of the waste handling, storage, or disposal areas been verified to conform with information in the ground water monitoring plan?	Y
7. Do the numbers, locations, and depths of the ground water monitoring wells agree with the data in the ground water monitoring system program? If "No," explain discrepancies.	Y
8. Have all monitoring wells been cased in a manner that: A. Maintains the integrity of the bore hole?	N *
B. Is screened and packed to enable sample collection at depths where appropriate aquifer flow exists?	Y
C. Prevents contamination of samples and ground water by sealing the annular space above the sampling depth with a suitable material? 3745-65-91(C)	N *
9. Has a ground water sampling and analysis plan been developed? 3745-65-92(A)	Y
A. Has it been followed?	Y
B. Is the plan kept at the facility?	Y
C. Does the plan include procedures and techniques for: 1) Measuring ground water elevations? 3745-65-92(A)(1)	Y
2) Detection of immiscible layers, where applicable? 3745-65-92(A)(2)	N
3) Collecting ground water samples including? 3745-65-92(A)(3) a) Well evacuation? 3745-65-92(A)(3)(a)	Y
b) Sample withdrawal? 3745-65-92(A)(3)(b)	Y
c) Sample equipment? 3745-65-92(A)(3)(c)	Y
d) Sample containers and handling? 3745-65-92(A)(3)(d)	Y
e) Sample preservation? 3745-65-92(A)(3)(e)	Y
4) Performing field analysis, including: a) Procedures and forms for recording raw data and the exact location, time, and facility specific considerations associated with the data acquisitions? 3745-65-92(A)(4)(a)	Y
b) Calibration of field instruments? 3745-65-92(A)(4)(b)	Y
c) Procedures for sample filtration? 3745-65-92(A)(4)(c)	Y
5) Decontamination of equipment? 3745-65-92(A)(5)	Y
6) Disposal of purge water? 3745-65-92(A)(6)	Y

Y - YES, N - NO, NA - NOT APPLICABLE
NS - NOT SPECIFIED, * - COMMENT

APPENDIX A-1	Y/N
7) Ground water sample analysis of all applicable constituents associated with the facility including: 3745-65-92(A)(7) a) Constituents? 3745-65-92(A)(7)(a)	Y
b) Analytical method and detection limit? 3745-65-92(A)(7)(b)	Y
c) Sample holding time? 3745-65-92(A)(7)(c)	Y
8) Quality assurance/quality control: a) Samples for field/lab/equipment blanks? 3745-65-92(A)(8)(a)	Y
b) Duplicate samples? 3745-65-92(A)(8)(b)	Y
c) Potential interferences? 3745-65-92(A)(8)(c)	Y
9) Chain of custody procedures: a) Standardized field tracking reporting forms to establish sample custody for the field prior to and during shipping? 3745-65-92(A)(9)(a)	Y
b) Sample labels containing all information necessary for effective sample tracking? 3745-65-92(A)(9)(b)	Y
10. Have the required parameters in ground water samples been tested quarterly for the first year? 3745-65-92(B) and (C)(1)	N/A*
A. Are the ground water samples analyzed for the following: 1) Parameters characterizing the suitability of the ground water as a drinking supply? 3745-65-92 B(1)	N
2) Parameters establishing ground water quality? 3745-65-92 B(2)	N
3) Parameters used as indicators of ground water contamination? 3745-65-92 B(3)	N
a) Are at least four replicate measurements obtained for each sample? 3745-65-92(C)(2)	N
b) Are provisions made to calculate the initial background arithmetic mean and variance of the respective parameter concentrations or values obtained from well(s) during the first year? 3745-65-92(C)(2)	N
B. For facilities which have complied with first year ground water sampling and analysis requirements: 1) Have samples been obtained and analyzed for the indicators of ground water quality at least annually? 3745-65-92(D)(1)	N
2) Have samples been obtained and analyzed for the indicators of ground water contamination at least semi-annually? 3745-65-92(D)(2)	N
C. Were ground water surface elevations determined at each monitoring well each time a sample was taken? 3745-65-92(E)	Y

Y - YES, N - NO, NA - NOT APPLICABLE
NS - NOT SPECIFIED, * - COMMENT

APPENDIX A-1	Y/N
D. Were the ground water surface elevations evaluated to determine whether the monitoring wells are properly placed? 3745-65-93(F)	Y
E. If it was determined that modification of the number, location or depth of monitoring wells was necessary, was the system brought into compliance with 3745-65-91(A)? 3745-65-93(F)	Y
11. Has an outline of a ground water quality assessment program been prepared? 3745-65-93(A)	Y
A. Does it describe a program capable of determining: 1) Whether hazardous waste or hazardous waste constituents have entered the ground water? 3745-65-93(A)(1)	Y
2) The rate and extent of migration of hazardous waste or hazardous waste constituents? 3745-65-93(A)(2)	Y
3) Concentrations of hazardous waste or hazardous waste constituents in ground water? 3745-65-93(A)(3)	Y
B. Have at least four replicate measurements of each indicator parameter been obtained for samples taken for each well? 3745-65-93(B)	N
1) Were the results compared with the initial background mean?	N
a) Was each well considered individually?	N
b) Was the Student's t-test used (at the 0.01 level of significance)?	N
2) Was a significant increase (or pH decrease) found in the: a) Upgradient wells?	N
b) Downgradient wells?	*
If "Yes," Compliance Checklist A-2 must also be completed.	
12. Have records been kept of analyses for parameters establishing ground water quality and indicators of ground water contamination? 3745-65-94(A)(1)	N/A
13. Have records been kept of ground water surface elevations taken at the time of sampling for each well? 3745-65-94(A)(1)	Y
14. Have the following been submitted to the Director: 3745-65-94(A)(2) A. Initial background concentrations of parameters listed in 3745-65-92(B)(1) within 15 days after completing each quarterly analysis required during the first year? 3745-65-94(A)(2)(a)	N/A
B. For each well, any parameters whose concentrations or values have exceeded the maximum contaminant levels allowed in drinking water supplies? 3745-65-94(A)(2)(a)	N/A
C. Annual reports including: 3745-65-94(A)(2)(b) 1) Concentrations or values of parameters used as indicators of ground water contamination for each well?	Y

Y - YES, N - NO, NA - NOT APPLICABLE
NS - NOT SPECIFIED, * - COMMENT

APPENDIX A-1	Y/N
2) Separate identification of any significant differences from initial background found in upgradient wells? 3745-65-94(A)(2)(b)	N/A
3) Results of the evaluation of ground water surface elevations?	Y
4) Was the Annual Report submitted by March 1 of the following year? 3745-65-75(F)	Y

Y - YES, N - NO, NA - NOT APPLICABLE
NS - NOT SPECIFIED, * - COMMENT

CHECKLIST A-1 - ADDENDUM AND COMMENTS

8.A. The cement apron surrounding well R-5 appears to be in need of repair and should be evaluated and repaired as needed.

8.C. The cement apron surrounding well R-5 appears to be in need of repair and should be evaluated and repaired as needed.

10. The facility has been in assessment monitoring for the entire period of compliance. The analytical parameter list consists of metals and VOCs.

11.B.2.b. The facility has gone directly into assessment monitoring since contamination was discovered in 1984. A detection monitoring system was never implemented at the facility.

APPENDIX A-2
INSPECTION COMPLIANCE FORM FOR A FACILITY THAT HAS DETERMINED IT MAY BE AFFECTING GROUND WATER QUALITY

Company Name: Ekco Housewares EPA I.D. Number: 045 205 424

Company Address: 359 State Ave., NW, P.O. Box 560, Massillon OH, 44648

Company Contact/Official: Paul Tag Title: Plant Manager

Date of Inspection: 2-15-94

Inspector's Name: Rich Kurlich Branch/Organization OEPA - NEDO

Type of facility: (check appropriately)	Y/N
a) surface impoundment	Y
b) landfill	N
c) land treatment facility	N
Ground Water Monitoring Program	
1. Has (Have) comparison(s) of ground water contamination indicator parameters for the upgradient well(s) 3745-65-93(B) shown a significant increase (or pH decrease) over initial background?	N *
A. If "Yes," has(have) the increase(s) been submitted to the Director as part of the annual report? 3745-65-94(A)(2)	N/A
2. Have comparisons of indicator parameters for the downgradient wells 3745-65-93(B) shown a significant increase (or decrease) over initial background?	N *
A. If "Yes," were additional ground water samples taken for those downgradient wells where the significant difference was determined? 3745-65-93 (C)(2)	N/A
1) Were samples split in two?	N/A
2) Was the significant difference due to laboratory error? (If "Yes," do not continue.)	N/A
3. If significant differences were not due to laboratory error, was a written notice sent to the Director within 7 days of (laboratory) confirmation? 3745-65-93(D)(1)	N/A
4. Within 15 days of notification of the Director was a ground water quality assessment plan (GWQAP) submitted? 3745-65-93(D)(2)	Y
A. Does the GWQAP specify the following: 1) Hydrogeologic conditions at the facility? 3745-65-93(D)(3)(a)	Y
2) The detection monitoring program implemented by the facility, including, but not limited to:	

Y = YES, N = NO, NA = NOT APPLICABLE
NS = NOT SPECIFIED, * = COMMENT

APPENDIX A-2	Y/N
a) The number, location, depth, and construction of detection monitoring wells with written documentation? 3745-65-93(D)(3)(b)(i)	N/A
b) A summary of detection monitoring analytical data with written documentation of the results? 3745-65-93(D)(3)(b)(ii)	N/A
c) A summary of statistical analyses applied to the data? 3745-65-93(D)(3)(b)(iii)	N/A
3) The investigative approach to be followed during the assessment, including, but not limited to:	
a) The proposed number, location, depth, installation method, and construction of monitoring wells? 3745-65-93(D)(3)(c)(i)	Y
b) The proposed methods for gathering additional hydrogeologic information? 3745-65-93(D)(3)(c)(ii)	Y
c) The proposed use of supporting methodology (e.g., soil gas analysis, geophysics)? 3745-65-93(D)(3)(c)(iii)	Y
d) The proposed methodology for determining contaminant migration rates? 3745-65-93(D)(3)(c)(iv)	Y
4) Sampling and analysis procedures as specified under paragraph (A) of Rule 3745-65-92 of the Ohio Administrative Code? 3745-65-93(D)(3)(d)	Y
5) Proposed data evaluation procedures, including, but not limited to: a) Utilization of statistical data evaluation? 3745-65-93(D)(3)(e)(i)	Y
b) Utilization of computer models? 3745-65-93(D)(3)(e)(ii)	Y
c) Criteria that will be utilized to determine if additional assessment activities are warranted? 3745-65-93(D)(3)(e)(iii)	Y
6) A schedule of implementation? 3745-65-93(D)(3)(f)	Y
B. Does the plan allow for determination of: 1) Rate and extent of migration of hazardous waste constituents? 3745-65-93(D)(4)(a)	Y
2) Concentrations of the hazardous waste or hazardous waste constituents? 3745-65-93(D)(4)(b)	Y
C. Is it indicated that the 1st determination was made as soon as technically feasible? 3745-65-93(D)(5)	Y
1) Within 15 days after determination, was a written report containing the assessment of ground water quality submitted to the Director?	N*
D. Has it been determined that hazardous waste or hazardous waste constituents from the facility have entered the ground water?	Y

Y = YES, N = NO, NA = NOT APPLICABLE
NS = NOT SPECIFIED, * = COMMENT

APPENDIX A-2	Y/N
1) If "No," was the original detection evaluation program, required by OAC Rule 3745-65-92 reinstated?	N/A
a) Was the Director notified of the reinstatement of the program within 15 days of the determination? 3745-65-93(D)(6)	N/A
E. If it was determined that hazardous waste or hazardous waste constituents have entered the ground water: 1) For facilities where the program was implemented prior to final closure, have determinations of hazardous waste or hazardous waste constituents continued on a quarterly basis? 3745-65-93(D)(7)(a)	Y
2) Were(are) records kept of the analyses and evaluations specified in the ground water quality assessment plan throughout the active life of the facility? 3745-65-94(B)(1)	Y
a) If a disposal facility, were (are) records kept throughout the post-closure period as well?	N/A
F. Are annual reports submitted to the Director containing the results of the ground water quality assessment program? 3745-65-94(B)(2)	Y
1) Do the reports include the calculated or measured rate of migration of hazardous waste or hazardous waste constituents?	Y
2) Have the annual reports been submitted by March 1 of the following year?(3745-65-75(F))	Y

Y = YES, N = NO, NA = NOT APPLICABLE
NS = NOT SPECIFIED, * = COMMENT

CHECKLIST A-2 - ADDENDUM AND COMMENTS

1. The facility has gone directly into assessment monitoring since contamination was discovered in 1984. A detection monitoring system was never implemented at the facility.

2. The facility has gone directly into assessment monitoring since contamination was discovered in 1984. A detection monitoring system was never implemented at the facility.

4.c.1. The Ground Water Quality Assessment Report is dated May 1989. The 16 new wells proposed in the March 1988 Ground Water Quality Assessment Plan were installed in May, June, and July 1988. Almost a full year passed between installation of the wells and the submission of the GWQA report.

L-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)

Well I.D. Date:	1st Quarter 2/7/91	2nd Quarter 5/10/91	3rd Quarter 8/6/91	4th Quarter 11/11/91
(DN) L-1	926.41	923.86	917.93	914.27
(DN) L-2	933.54	931.01	925.94	924.85
(DN) L-4	930.83	928.96	929.13	929.35
(DN) L-5	927.47	928.60	929.13	928.67
(UP) L-3	932.79	931.54	929.01	928.49

(DN) - Indicates a downgradient well.

(UP) - Indicates an upgradient well.

(Weston, 1992a)

R-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)

Well I.D. Date:	1st Quarter 3/08/91	2nd Quarter 6/04/91	3rd Quarter 8/07/91	4th Quarter 11/22/91
R-1	904.91	904.91	899.91	896.51
R-2	918.32	917.32	912.32	906.11
R-3	917.14	916.14	910.14	898.83
R-4	920.28	919.28	914.28	910.38
R-5	-	-	906.93	905.44

<u>Note:</u>

Wells R-1 through R-4 were originally located proximal to the plant area and near suspected areas of concern to indicate downgradient groundwater quality. Under the on-going Interim Remedial measure pumping scheme, these wells are not downgradient from the plant.

(Weston, 1992a)

R-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)

Well I.D. Date:	1st Quarter 2/6/92	2nd Quarter 5/7/92	3rd Quarter 8/6/92	4th Quarter 11/9/92
R-1	898.20	896.55	897.82	898.21
R-2	909.59	908.43	909.41	910.55
R-3	906.93	899.48	900.13	901.78
R-4	913.17	910.78	912.43	914.58
R-5	907.88	905.78	900.48	907.92

Note:

Wells R-1 through R-4 were originally located proximal to the plant area and near suspected areas of concern to indicate downgradient groundwater quality. Under the on-going Interim Remedial measure pumping scheme, these wells are not downgradient from the plant.

(Weston, 1993)

L-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)

Well I.D. Date:	1st Quarter 2/6/92	2nd Quarter 5/7/92	3rd Quarter 8/6/92	4th Quarter 11/9/92
(DN) L-1	915.25	921.32	922.03	918.01
(DN) L-2	924.57	929.82	930.75	927.82
(DN) L-4	929.55	929.83	929.79	929.75
(DN) L-5	928.85	929.00	929.31	929.27
(UP) L-3	930.19	931.38	932.61	930.91

(DN) - Indicates a downgradient well.

(UP) - Indicates an upgradient well.

(Weston, 1993)

L-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)
LAGOON MONITOR WELLS

Well I.D. Date:	1st Quarter 2/16/93	2nd Quarter 5/6/93	3rd Quarter 8/11/93	4th Quarter 11/11/93
(DN) L-1	922.25	926.44	921.03	918.02
(DN) L-2	930.49	933.22	928.70	928.43
(DN) L-4	931.25	932.41	930.01	930.59
(DN) L-5	929.80	929.92	929.43	929.53
(UP) L-3	929.13	929.29	929.12	928.84

(MSL) - Mean sea level.

(DN) - Indicates a downgradient well.

(UP) - Indicates an upgradient well.

(Weston, 1994)

R-WELL
GROUNDWATER SURFACE ELEVATIONS (MSL)
BEDROCK MONITOR WELLS

Well I.D. Date:	1st Quarter 2/16/93	2nd Quarter 5/6/93	3rd Quarter 8/11/93	4th Quarter 11/11/93
R-1	897.26	900.91	900.91	903.70
R-2	909.01	912.94	915.32	913.36
R-3	900.05	913.14	913.14	912.73
R-4	914.20	915.85	915.15	916.99
R-5	907.59	910.17	908.70	911.28

Note:

Wells R-1 through R-5 were originally located proximal to the plant area and near suspected areas of concern to indicate downgradient groundwater quality. Under the on-going Interim Remedial measure pumping scheme, these wells are not downgradient from the plant.

(Weston, 1994)

COMPREHENSIVE GROUND WATER MONITORING EVALUATION

OF

EKCO HOUSEWARES, INCORPORATED

STARK COUNTY

MASSILLON, OHIO

OHD045205424

OHIO ENVIRONMENTAL PROTECTION AGENCY

JUNE 7, 1991

OhioEPA
State of Ohio Environmental Protection Agency

P.O. Box 1049, 1800 WaterMark Dr.
Columbus, Ohio 43266-0149
(614) 644-3020
FAX (614) 644-2329

George V. Voinovich
Governor

July 19, 1991

Re: Ekco Housewares, Inc.
OHD045205424
Stark County

Mr. Thomas Shingleton
Ekco Housewares, Inc.
359 State Avenue, N.W.
P.O. Box 560
Massillon, OH 44658

Dear Mr. Shingleton:

Enclosed is the final report for the Comprehensive Ground Water Monitoring Evaluation (CME) conducted on February 7, 1991, at the Ekco Housewares, Inc.'s facility located in Massillon, Ohio.

The CME was conducted to determine the Ekco Housewares, Inc.'s compliance with the interim status standards for owners and operators of hazardous waste treatment, storage and disposal facilities, specifically rules 3745-65-90 through 3745-65-94 of the Ohio Administrative Code (OAC). The above noted OAC regulations pertain to ground water monitoring. The CME was conducted by Rich Kurlich of the Division of Ground Water. Karen Nesbit, Division of Solid and Hazardous Waste Management, was also present.

The CME report consists of several sections including background information and data on the facility's history and operation, a discussion of the hydrogeology, a description of the groundwater monitoring activities at the facility and various checklists and comments developed from these checklists.

A review of the CME revealed violations and deficiencies that are occurring or have occurred at the facility which are explained in the Compliance Status Summary section on pages 15 through 17 of the enclosed report.

Please submit written documentation demonstrating what actions Ekco Housewares, Inc. has taken or intends to take to abate the violations and deficiencies explained in the enclosed report within thirty days of receipt of this letter to both me and Karen Nesbit of the Northeast District Office.

If you have any questions, please contact Keith Dimoff at (614) 644-2934. Questions of technical nature should be directed to Rich Kurlich of the Division of Ground Water at (216) 425-9171.

Sincerely,

C. David Stroh, Supervisor
Enforcement Unit
Hazardous Waste Enforcement Section
Division of Solid and Hazardous Waste Management

Reviewed by:

Pamela S. Allen

Pamela S. Allen, Manager
Hazardous Waste Enforcement Section
Division of Solid and Hazardous Waste Management

Sp.DS.PA.kd/lcn

cc: Tom Allen, DGW
Harry Courtright, NEDO, RCRA Group Leader
Carolyn Reierson, HWES, DSHWM
Keith Dimoff, HWES, DSHWM
Chris Khourey/Rich Kurlich, DGW, NEDO
Sally Averill, USEPA

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I. GENERAL INFORMATION

Purpose

The purpose of this report is to document the results of a Comprehensive Ground Water Monitoring Evaluation (CME) conducted at the Ekco Housewares, Incorporated facility in Massillon, Ohio. The objective of a CME is to determine whether the owner/operator has, in place, a ground water monitoring system that is adequately designed, operated and maintained as required under the Ohio Administrative Code (OAC) rules 3745-65-90 through 3745-65-94.

As part of the CME, a site inspection was performed on February 7, 1991. The purpose of this inspection was to observe the adequacy of the sampling procedures, monitor well location verification, a surficial monitor well integrity inspection and to review the written records pertaining to the ground water monitoring system. Present during this evaluation were Rich Kurlich, Geologist, Ohio EPA, Northeast District Office (NEDO) - Division of Groundwater; Karen Nesbit, Environmental Specialist, Ohio EPA, NEDO - Division of Solid and Hazardous Waste Management (DSHWM); Tom Shingleton, Plant Manager, Ekco Housewares; Greg Flasinski, Technician, Weston; and Wayne Hoskings, Technician, Weston.

Information Sources

In addition to information acquired during the site inspection and review of correspondences contained in Ohio EPA files, the following documents provided information upon which this CME report is based:

Delong and White, 1963, Geology of Stark County: ODNR Bulletin No. 61.

Morningstar, H., 1922, Pottsville Fauna of Ohio: Ohio Division of Geological Survey Bulletin 25, Fourth Series.

Ohio EPA, 1988, Comprehensive Groundwater Monitoring Evaluation of Ekco Housewares, Incorporated, Massillon, Ohio: Ohio EPA, June 27, 1988.

Schmidt, J.J., 1962, Underground Water Resources of the Tuscarawas River and Sugar Creek Basins: ODNR Map.

Weston, R.F., 1988, Ground Water Quality Assessment Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, March, 1988.

________, 1988, RCRA Closure Plan for Ekco Housewares, Inc., Massillon, Ohio, Volume I (draft): prepared for Ekco

Housewares, August 1988.

________, 1988, Quality Assurance Management Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, September 1988.

________, 1989, Groundwater Quality Assessment Report for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, May 1989.

________, 1989, RFI/CMS Work Plan for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, June 1989.

________, 1991, Annual Groundwater Monitoring Report for Ekco Housewares, Inc., Massillon, Ohio: prepared for Ekco Housewares, February 1991.

Inspection Checklists

Attached to this report are three checklists from the Interim Status Ground Water Monitoring Program Evaluation (SW954). The checklists deemed appropriate for this facility are: Appendix A: Comprehensive Ground Water Monitoring Evaluation; Appendix A-1: Facility Inspection Form for Compliance with Interim Status Standards Covering Ground Water Monitoring; and Appendix A-2: Inspection Compliance Form for a Facility which has Determined it may be affecting Ground Water Quality.

II. SITE HISTORY AND OPERATIONS

A considerable portion of the text dealing with site history, geology, and hydrogeology was taken from a CME prepared by the Ohio EPA (1988).

Facility Name

Ekco Housewares, Incorporated, Massillon, Ohio.

EPA I.D. Number

OHD 045 205 424

Facility Location

The Ekco Housewares, Inc. facility is located in the northwest portion of Massillon in Stark County at 359 State Avenue, N.W. The facility occupies 13 acres and is primarily surrounded by industrial and urban complexes. The Ekco property is triangular in shape and lies approximately 1,500 feet west of the Tuscarawas River. The facility is bordered to the north by Newman Creek, while the Penn Central and the Baltimore and Ohio

Railroads border the Ekco property to the south, west and east. Figure 1 depicts the regional and local location along with local business.

A variety of businesses operate adjacent to the Ekco plant. These include Ohio Packaging (paper) to the south, sand and gravel quarries to the west and northwest, Carter Lumber (retail) and American Drain Pipe (concrete pipe) to the north and the Ohio Water Service (public water supply waterworks) to the east. The Baltimore and Ohio Railroad has numerous spurs and sidetracks adjacent to the Ekco plant that are used for storage of rail cars and Conrail track maintenance vehicles.

Facility Description

The Ekco Housewares facility has been manufacturing primarily cookware/bakeware since 1945. In 1945, the Ekco Housewares facility was manufacturing aluminum and stainless steel cookware. By 1951, the plant was manufacturing 90 mm and 105 mm shell casings for the military. This process increased production and required the installation of two production wells (W-1 and W-2). In 1953 a surface impoundment was constructed along the northern property boundary adjacent to Newman Creek. Sludge from the waste treatment of the military production was discharged to the surface impoundment.

During 1954, Ekco Housewares began its electroplating operations. The primary function of these operations was to copper plate cookware manufactured at the facility. Solvents (primarily trichloroethylene [TCE] or 1,1,1 trichloroethane [TCA]) were used to clean the products prior to plating. However, TCA and TCE were never used at the same time. Ekco Housewares discontinued use of TCE sometime during the mid 1960's. When copper plating and printing operations were in use after 1954, all process water, including alkaline cleaning rinse waters, boiler blowdown, and deionizer water was piped to the lagoon.

By 1967, Ekco Housewares began to manufacture porcelain and teflon coated cookware. In 1969, Ekco Housewares was permitted under NPDES regulation to discharge the waste products associated with plant activities to the surface impoundment.

Ekco, however, discontinued the manufacturing of aluminum and porcelain cookware and use of the lagoon ceased in 1977. By the end of 1978, all copper plating operations had ended and the principal products manufactured at the facility became pressed and coated non-stick bakeware. The surface impoundment was reinstated in 1980 under the same NPDES permit to receive wastewater. The unit was permanently removed from operation in December 1985.

Ekco Housewares continues to manufacture pressed and coated non-stick bakeware. The operations that generated hazardous waste at the facility include degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent).

Hazardous Waste Generated

Waste products generated at various intervals during the operational history of the Ekco Housewares facility and subsequently disposed in the lagoon include:

Trichloroethylene and 1,1,1 trichloroethane used as a degreasing solvent during electroplating operations starting 1954.

Process water, including alkaline cleaning rinse waters, boiler blowdown and deionizer water from copper plating and printing operations after 1954.

Deionizers from copper plating operations (hydrochloric acid and sodium hydroxide) and washings and waste material from manufacturing porcelain-teflon coated aluminum cookware (aluminum frit, various coloring inorganic oxides, lead, cadmium, selenium, cobalt and toluene) starting 1969.

Ekco discontinued use of the lagoon in 1977. Later, from 1980 until 1985, hazardous waste generated at the facility during degreasing (degreaser still bottom wastes - F001, D007, D009) and silicon coating of the bakeware (waste paint, F005 spent solvent) was again discharged to the lagoon. The lagoon was permanently decommissioned in 1985 (Weston, May, 1989). Since 1985, all hazardous waste generated at the site was drummed and shipped to Ross Incineration for disposal as of the time of the 1991 CME inspection.

Hazardous Waste Treatment, Storage and Disposal

In summary, the surface impoundment was used noncontinuously for approximately 28 years total. During that time period actual waste products and volume of liquid or sludge discharged to the impoundment is not well documented. Approximately 0.2 MGD of wastewater potentially containing heavy metals, solids and alkalines was discharged to the lagoon when the plating line (1954) was in operation until 1978. There was not any surface discharge from the lagoon.

In 1984, the company was informed that because hazardous waste was placed in the lagoon since the effective date of RCRA (1980) the lagoon is classified as a hazardous waste surface impoundment.

The facility currently is permitted (NPDES # 3IC00009001) to discharge cooling water to Newman Creek. The source of the cooling water is ground water that is pumped at the facility and only used in a non-contact cooling process and then treated through an air-stripper unit prior to discharge.

Regulatory History

Ekco Housewares notified U.S. EPA of its Generator Status in August, 1980. However, a Part A application was not submitted by November 19, 1980 as required by 40 CFR 270.10 and Interim Status was not achieved. Ground water contamination was discovered in 1984 by the facility after completing a volatile organic compounds (VOC) analysis on production well water as required by a NPDES permit renewal. A VOC analysis of the Newman Creek discharge under NPDES permit, outfall 001, indicated the presence of a number of volatile organic compounds, specifically TCE and TCA. A packed aeration treatment unit (air-stripper) was installed in 1985 to treat contaminated ground water. In 1984, the company was informed by the Ohio EPA that because hazardous waste was placed in the lagoon since the effective date of RCRA, the lagoon is classified as a hazardous waste surface impoundment.

In May 1986, Ekco Housewares was referred to U.S. EPA for enforcement of RCRA violations resulting from operation of a hazardous waste surface impoundment without a permit. In November 1986, U.S. EPA filed a Complaint, Findings of Violation and Compliance Order against Ekco Housewares that noted violations of RCRA regulations. These violations included all of 40 CFR 265 subpart F. In November 1987, a Partial Consent Agreement and Final Order was filed by U.S. EPA regarding the Ekco Housewares RCRA violations. A summary of ground water monitoring requirements contained in this document are as follows:

1. Ekco Housewares must develop and submit a plan for a groundwater quality assessment program pursuant to 40 CFR 265.93 within fifty-six days of the effective date of the order.

2. Upon approval and/or modification of the groundwater quality assessment plan by U.S. EPA, Ekco Housewares shall immediately initiate and complete, according to the schedule of implementation, the activities in the approved plan.

A draft Closure Plan for the surface impoundment and a draft Ground Water Quality Assessment Plan were submitted to U.S. EPA in January and February 1988, respectively. A draft of the Interim Measures Plan for Recommended Additional Interim Measures was submitted to U.S. EPA in February, 1988. A revised Ground Water Quality Assessment Plan (GWQAP) was submitted to the U.S. EPA in March 1988 and subsequently was approved by the U.S. EPA with modifications on April 4, 1988. Ekco Housewares is currently implementing the procedures and additional site work as specified in the GWQAP.

On June 27, 1988, a Comprehensive Ground Water Monitoring Evaluation (CME) was completed by the Ohio EPA. As a result of this CME, Ekco Housewares was cited for several violations of the Ohio Administrative Code. These violations are listed below:

1. Ekco Housewares has failed to have at least one monitoring well hydraulically upgradient from the regulated unit (OAC 3745-65-91 (A)(1)).

2. Ekco Housewares has failed to develop and follow a ground water sampling and analysis plan (OAC 3745-65-92(A)).

3. Ekco Housewares has failed to determine the vertical extent of contaminant migration (OAC 3745-65-93(D)(4)(a)).

4. Ekco Housewares has failed to submit an annual report containing the results of the ground water quality program determining the calculated (or measured) rate of hazardous waste during the reporting period (OAC 3745-65-94(B)(2)).

The Ohio EPA notified Ekco Housewares, in a letter dated July 6, 1988, of the above findings in a Notice of Violations and indicated that these violations should be adequately addressed upon proper implementation of the Ground Water Quality Assessment Plan as conditionally approved by the U.S. EPA in April 1988.

A Closure Plan was submitted to the Ohio EPA on August 15, 1988. The plan was found to not meet OAC standards and was disapproved on January 4, 1989, with an effective date of February 6, 1989. An adjudication hearing was requested on February 2, 1989 by Wilkie, Farr, and Gallagher on behalf of Ekco Housewares, Inc. The Closure Unit of the RCRA Technical Assistance Section of DSHWM has indicated that the closure plan is still in adjudication.

A 3008 (h) Corrective Action Order was agreed to by Ekco Housewares, Inc. and the U.S. EPA on March 31, 1989 with an order date of April 14, 1989. In this, the facility was ordered to submit to the U.S. EPA a workplan for a RCRA facility investigation (RFI) and a corrective measures study (CMS). This work plan, dated June 1989, was designed to delineate the presence, magnitude, extent, direction and rate of movement of any hazardous waste constituents emanating from the facility within and beyond its boundary. This document refers to the facility in general and not to the surface impoundment specifically.

III. REGIONAL AND SITE HYDROGEOLOGY

Regional Geologic Setting

Stark County lies in two subdivisions of the Appalachian Plateau province. The northern two-thirds of the county lies in the glaciated section of the Appalachian Plateau, and the southern one-third in the unglaciated section (White, 1963). The glacial drift thickness ranges from less than 25 feet to about 100 feet. In the areas of buried valleys however, the unconsolidated material can be as much as 270 feet thick (Schmidt, 1962). Underlying these glacial drift and outwash deposits are sedimentary rocks (sandstone, shale, limestone and coal) of the Pennsylvanian, Mississippian, and Devonian age. Pennsylvanian age deposits consist of the Homewood, Mercer, Massillon and Sharon members of the Pottsville Formation. Mississippian age deposits consist of the Cuyahoga Group and the Berea Sandstone. The Mississippian-Devonian deposits are described as pre-Berea rocks undifferentiated. These bedrock formations dip generally to the southeast at about 20 to 40 feet per mile.

The present drainage pattern of the glaciated section of Stark County is for the most part a direct result of the Wisconsin glaciation. The present Tuscarawas River occupies the valley of the old Dover (Teays Stage) and Newark (Deep Stage) Rivers. A significant erosional level at 900 to 950 feet elevation along the Tuscarawas River Valley represents the Parker Strath of Teays time. Deep entrenchment of the Teays valley is evident from drill records, but owing to the great thickness of the valley fill, few wells penetrate to bedrock, hence knowledge of the gradient of the entrenchment is unknown (White, 1963).

Site Geology

The Ekco Housewares facility is located on a western terrace of the Tuscarawas River Valley. Flood control levees now separate the site from the Tuscarawas river and Newman Creek. In 1987, 25 soil borings were advanced across the facility in order to better characterize site geology. This information, supplemented by additional water well and monitor well drilling logs, indicates that the site directly overlies glacial outwash deposits of interbedded and interlensing clay, silt, silty sand, sand and gravel. These unconsolidated materials appear to thicken to the east and northeast with thicknesses ranging from a thin veneer near the western property boundary of the plant to 92 feet northeast of the plant. Thick sand and gravel outwash deposits (greater than 250 feet) also are present immediately east of the site. The top-of-bedrock contour map of Stark County indicates that the bedrock surface lies at approximately 950 feet mean sea level southwest of the plant and dips to 900 feet m.s.l. east and northeast of the site. Wells drilled to the bedrock on Ekco Housewares property indicate that the depth to bedrock under the site ranges from a few feet along the western property boundary to approximately 72.5 feet along the eastern property boundary. Adjacent to the site, the depth to bedrock increases to 132 feet at well I-6, located immediately east of the facility, and 108 feet at well P-4, located north of the facility.

The bedrock beneath the outwash deposits consists of interbedded sandstone with shale lenses of 1 to 5 foot thickness belonging to the Pennsylvanian Pottsville Group, probably the Sharon Sandstone member. The thickness of the Sharon Sandstone is reported to be approximately 255 feet (Morningstar, 1922). Available well logs indicate that the shale layers are discontinuous from well to well.

Local Hydrogeology

The buried valley deposits of sand and gravel and the underlying Pottsville Group are the principle aquifers utilized in the Massillon area. Within a one mile radius of the site, approximately 50 domestic and 5 commercial wells (including W-1, W-2 and W-10 on the Ekco Housewares property) are completed in the Pottsville Group and approximately 6 municipal wells tap the highly permeable sand and gravel deposits within the buried valley. The average depth of the commercial and municipal wells is approximately 225 and 150 feet, respectively.

Although the literature has reported groundwater yields from individual wells installed in the Pottsville Group of only 25 to 100 gallons per minute, Ekco's two on-site production wells collectively withdraw over 400 gallons per minute. However, drilling logs for wells W-1 and W-2 indicate that the sandstone formation was shot with up to 200 pounds of 60% dynamite to fracture the formation and increase well yield. Yields of over 2,000 gallons per minute have been obtained from the local municipal wells completed in the sand and gravel outwash deposits located east and northeast of the site. Calculated values for transmissivity and storativity in the bedrock zone ranged from 12,000 gpd/foot and 0.0001 to 68,000 gpd/foot and 0.002, respectively (Weston, May, 1989).

The existing on-site monitoring wells are completed in both bedrock and unconsolidated glacial material (Figure 2). Water levels in the bedrock monitoring wells range from 22 to 52 feet below the ground surface. The water levels in these wells are affected by the pumping of wells W-1 and W-10. The wells near the lagoon, to the north of the facility, are completed in fill and unconsolidated outwash deposits and appear to have a water table closer to the surface. Water levels from these wells are reported to be from 9 to 26 feet below the ground surface. It is unclear if the shallow monitoring wells north of the facility are also affected by the on-site pumping wells.

Ground water elevation data from August 10, 1988 was used to generate a potentiometric surface map (Figure 3). Ground water elevation data obtained during the 1991 CME inspection was also used to generate a potentiometric surface map (Figure 4). A comparison of these two figures indicates significant changes in ground water flow direction, possibly due to pumping and non-pumping conditions of nearby water production wells or seasonal fluctuations related to significant amounts of rainfall that fell previous to the CME inspection date. Potentiometric surface maps generated from quarterly data obtained in 1990 also exhibit flow directions that are similar to the August 10, 1988 map, but with some variation.

Local Surface Water

The northern property boundary of Ekco lies along Newman Creek, an eastward flowing tributary to the Tuscarawas River. The Tuscarawas River lies approximately 1500 feet east of the facility and flows southward through Massillon. Flood control levees are visible along both water bodies. During the CME inspection Newman Creek was in flood stage. Considerable debris deposited by high water around monitoring wells L-4 and L-5 shows that Newman Creek at times experiences very high water levels.

IV. GROUND WATER MONITORING WELL SYSTEM

Ground Water Monitoring History

Several "series" of production and monitoring wells have been installed at the Ekco facility over the years (Figure 2). The W-series are production wells of which two are currently being used by the facility to recover contaminated ground water. Well W-10 is currently being used as a production and recovery well and was installed during the 1940's, however, actual construction details are unknown. Wells W-1 and W-2 were installed in April 1951 to facilitate increased production. Well W-1 is currently being used as a recovery well for ground water contamination. Well W-2 is an out-of-service production well that is currently being used to monitor for ground water contamination. All of the production wells are constructed of 12-inch steel casing and are installed in the Pottsville sandstone. Increased yields for wells W-1 and W-2 were accomplished by fracturing the sandstone with up to 200 pounds of

60% dynamite between 115 and 165 feet below the ground surface. The production wells are not screened and are open boreholes below the unconsolidated outwash deposits.

The R-series bedrock monitoring wells were installed in October 1984 by Ohio Drilling Company to evaluate on-site ground water contamination migration. The wells are installed into the Pottsville sandstone and are cased with six-inch diameter steel pipe through the unconsolidated outwash deposits and left open for the entire length of the borings in the sandstone formation. The cased portions of the wells are not grouted or sealed above the sampling position within the well. All R-series wells have dedicated pumps that are placed in the upper portion of the water table permanently.

Also in October 1984, four test boring holes were completed at the facility to determine potential sources of contamination. Two test borings (P-1-84 and P-2-84) were converted to 1-1/4 inch diameter piezometers with either three or five feet of slotted screen. The piezometers were backfilled with clean gravel, then sealed with bentonite to the surface.

In January 1987 the D-series wells were completed and constructed of 1-1/2 inch PVC casing with 10 or 15 feet of PVC screen. All D-series wells were installed using hollow stem auger drilling methods and continuous soil samples were taken in an 18 or 24 inch split-spoon sampler driven ahead of the auger. All wells were sand packed to two feet above the screen and filled with bentonite pellets and grouted to the surface. Protective outside steel casings with locking caps were placed over the well casings.

During the summer of 1988, 16 new monitoring wells were installed and incorporated into the monitoring network (Weston, May, 1989). These wells are discussed below.

<u>Monitoring Well Installation and Construction</u>

Monitoring wells installed since the May 16, 1988 CME inspection date were constructed of either two-inch PVC screens and risers (P-3, P-5), two-inch low carbon steel risers and wire wound type 304 stainless steel screens (P-4), or four-inch wire wound type 304 stainless steel screens and low carbon steel risers (S-7, I- and L-series). Well R-5 has a six-inch low carbon steel riser with no screen. The screen lengths for the remaining wells are 10 feet except for P-5 which has a 5 foot screen. Figure 2 indicates the locations of all well installed at the site.

The borehole annular space is filled with a silica sand pack to approximately two feet above the top of the screen followed by a two foot plug of sodium bentonite and a grout mixture of bentonite/portland cement to the surface. A protective casing with locking cap was placed over each well and cemented in place.

Adequacy of Monitoring Well Network

During the November 1990 ground water sampling event, upgradient well L-3 indicated significant levels of trichloroethene (130 ug/l), vinyl chloride (5 ug/l) etc. Ekco Houseware's consultant has identified this data as being inadvertently switched with the data belonging to well L-1. However, ground water elevation data collected during the February 1991 CME inspection, after several days of heavy rainfall, suggests that radical changes in flow directions can occur at the facility due to temporal events. For this reason, it appears that well L-3 may not consistently monitor background water quality near the lagoon. Available ground water elevation data should be evaluated and the need for a new upgradient well location should be evaluated. Rule 3745-65-91 (A)(1) of the OAC requires that a facility install at least one hydraulically upgradient well that is representative of background water quality and not affected by the facility.

Since all downgradient wells included in the assessment monitoring network have shown ground water contamination including the shallow L-series wells (L-1, L-2, L-4 and L-5) and the deeper well R-5, the assessment monitoring network should be expanded to define the vertical and horizontal extent of contamination. This can be accomplished by drilling additional wells and/or including already existing site wells in the monitoring system.

An inspection of the L-series wells noted a few maintenance deficiencies.

a. No survey marks for measuring water level elevations were present on the well casings.

b. Well identification numbers were not present on wells L-5, L-2 and L-1 and barely visible on well L-4.

c. The cement apron surrounding wells L-3 and L-1 are starting to crack and will need repaired in the near future.

d. The locking mechanism on well L-1 is broken and does not prevent unauthorized access to this well. The protective casing should be repaired and locked. This well is also located in an area of potential traffic and therefore, should have guard posts installed to further protect the wellcasing.

e. During the CME inspection Newman Creek was in bank full stage and showed evidence of having recently overflowed its banks. Wells L-4 and L-5 are located on the flood plain of Newman Creek and potentially may become submerged during periods of high water flow. This is evidenced by the presence of water-deposited trash and organic debris around the bases of wells L-4 and L-5. Furthermore, L-4 has no end cap covering the inner casing and the end cap covering L-5 is broken into two pieces, therefore, river waters are free to enter the wells. Water-tight end caps should be installed on wells L-4 and L-5.

V. SAMPLING AND ANALYSIS PLAN AND PROCEDURES

Sampling and Analysis Plan

The Sampling and Analysis Plan currently used at the facility is based on two documents prepared by Weston. These documents consist of the Quality Assurance Management Plan for Ekco Housewares, Inc. Massillon, Ohio (Weston, 1988) and the Groundwater Quality Assessment Report for Ekco Housewares, Inc., Massillon, Ohio (Weston, 1989). The Groundwater Quality Assessment Report addresses the sampling of additional monitoring wells installed since preparation of the first SAP. The Sampling and Analysis Plan as reviewed for this CME, will meet adequately the requirements of rule 3745-65-92 (A) of the Ohio Administrative Code if properly implemented after the following modification is made:

> The SAP does not discuss the detection of immiscible layers as required by Rule 3745-65-92(A)(2) of the OAC. A discussion of detecting for immiscible layers should be added to the SAP. If detecting for immiscible layers is not applicable to the site, this should be stated in the SAP.

Currently, Ekco Housewares personnel sample the R-Series wells on a quarterly basis in March, June, September and December of each year. These wells are not sampled according to the protocol described in the Sampling and Analysis Plan. In order to maintain consistency of analytical results, all sampling of monitoring wells should be performed according to the SAP. Rule 3745-65-92(A) of the OAC requires the owner\operator to develop and follow a ground water SAP.

Field Evaluation of Sampling and Analysis Procedures

As part of the CME inspection, the procedures for sampling the L-series wells were evaluated. The L-series wells are sampled on a quarterly basis in February, May, August and November of each year. Dedicated bottom filling bailers were used to both purge and collect samples from each well. The bailers were wrapped in aluminum foil between use and lowered into the wells using dedicated rope. A sheet of plastic was placed on the ground to prevent contamination of the sampling equipment or the ground. The VOA bottles were filled first and followed by the field filtration of the samples destined for dissolved metals analysis. Ekco's consultant Weston used disposable, dedicated filtering equipment. Ground water samples were placed in coolers after collection.

VI. ASSESSMENT MONITORING

Assessment Sampling Events

Assessment sampling events are conducted quarterly on the L-series wells in February, May, August and November of each year. The Ohio EPA has received analytical results for the initial sampling of these wells in November 1988 and results from the 1990 sampling events. Ekco Housewares did not sample these wells during 1989 and therefore has failed to maintain the quarterly sampling frequency required by rule 3745-65-93(D)(7)(a) of the OAC. Table 1 includes the dates of known sampling events at the facility.

No data was supplied for well R-5 in 1990. The annual report for 1990 does not include a summary of the analytical data nor does it include analysis of the rate and extent of contaminant migration. Ekco Housewares has failed to meet annual reporting requirements of rule 3745-65-94 (B)(2) of the Ohio Administrative Code (OAC).

Analytical Results

Table 2 lists analyzed parameters that exceed the Primary and Secondary Drinking Water Standards for each well for the November 1988 and the 1990 sampling events. Quarterly ground water data were not collected for the interim status monitoring network during 1989 and is a violation of rule 3745-65-93(D)(7)(a) of the OAC. Arsenic and barium were the only parameters to exceed the primary standards for the November 1988 sampling event. Ekco Housewares states that arsenic and barium were detected in the field blanks, however, a review of the November 1988 blank data suggests that the field and trip blanks were either not analyzed or did not detect these parameters. These two elements were commonly detected but at below primary drinking water standards during the 1990 sampling year. No analytical parameters exceeded the primary or secondary drinking water standards during 1990.

Chlorinated solvents such as trichloroethene and various decay products (such as vinyl chloride) were detected in several of the wells including L-1, L-2, L-5 and R-5 in November 1988. The greatest concentrations of these contaminants were detected in wells L-1 and L-5, and in L-2 and R-5 to a lesser quantity. Methylene chloride also was detected in all five L-series wells and in R-5, however, this detection in some cases may be the result of laboratory contamination due to its presence in the field blanks. Only samples L-3 and L-4 contain methylene chloride concentrations less than the concentrations observed in the field blanks. Wells L-1, L-2 and L-5 contain methylene chloride concentrations several times the field blank levels and, therefore, may not be entirely the result of laboratory contamination. Acetone was also detected in the field blank at a low concentration. Wells L-1 and L-2 contain acetone concentrations of 11 ug/l and 10 ug/l, respectively, and may be the result of laboratory contamination. Well L-5 contains 74 ug/l of acetone and may not be entirely the result of laboratory contamination. The presence of methylene chloride and acetone should be evaluated in future sampling events to determine whether these compounds can be attributed to the facility or to laboratory contamination.

During the 1990 sampling events chlorinated solvents were detected in wells L-1, L-2, L-4 and L-5 for all four quarters. The greatest contamination is found in wells L-1, L-2 and L-5. Well L-4 consistently shows ground water contamination but at lesser concentrations relative to the other downgradient wells. Levels of trichloroethene ranged from non-detected to 320 ug/l (L-2). During August 1990, carbon disulfide was identified for the first and only time in wells L-4 and L-5. This compound was not identified in blank analyses. Ekco did not discuss the presence of this compound in their 1990 annual report.

The results of these volatile organic compound analyses conducted on samples obtained in November 1988 and during the quarterly 1990 sampling year are listed in Table 3.

The ground water flow map generated from measurements made during February 1991 suggests that well L-3 may not be located upgradient of the lagoon at all times during the year. The analytical results for future quarters should be examined closely to determine whether ground water contamination detected in well L-3 is due to this change in ground water flow direction.

<u>Annual Reporting Requirements</u>

Ekco Housewares is required to submit by March 1 of each year an annual report detailing the results of the assessment monitoring program. This report should include presentation of analytical data and a discussion of the rate and extent of contamination. Ekco has not met minimum content requirements of rule 3745-65-94(B)(2) of the Ohio Administrative Code for the 1989 and 1990 annual report submittals. The L-series and R-5 wells were not sampled during 1989. During 1990, four quarters of ground water data were collected but no data was supplied for well R-5. It is unclear whether well R-5 was sampled during the quarterly assessment sampling events. Furthermore, the annual report for 1990 failed to make a determination of the rate and extent of migration of hazardous waste or hazardous waste constituent in the ground water.

VII. COMPLIANCE STATUS SUMMARY

As a result of this CME, several violations and deficiencies in regards to state interim status ground water monitoring regulations, rules 3745-65-90 through 3745-65-94 of the Ohio Administrative Code, have been identified. Each violation and deficiency is listed below, and a brief corresponding explanation of the nature of the problem is given.

Violations

Violation 1 OAC Rule 3745-65-92(A)(2)

The Sampling and Analysis Plan fails to discuss the detection of immiscible layers in monitoring wells installed at the facility.

The Sampling and Analysis Plan does not discuss the detection of immiscible layers as required by Rule 3745-65-92(A)(2) of the OAC. If detecting for immiscible layers is not applicable to the site, this should be stated in the SAP.

Violation 2 OAC Rule 3745-65-93(D)(7)(a)

Ekco Housewares has failed to determine the rate and extent of migration and the concentrations of hazardous waste or hazardous waste constituents in ground water on a quarterly basis.

No analytical ground water data was collected during 1989. Quarterly ground water data must be collected until final closure.

Violation 3 OAC Rule 3745-65-93(D)(4)

Ekco Housewares has failed to determine the rate and extent of migration and concentrations of hazardous waste or hazardous waste constituents in the ground water associated with the management of the hazardous waste surface impoundment.

An evaluation of the rate and extent of migration of contamination should be performed by expanding the assessment monitoring network both vertically and horizontally downgradient of known contamination. This can be accomplished by either drilling new wells and/or using already existing wells on site. The ground water flow direction observed in Figure 4 suggests a need for the installation of a monitoring well across Newman

Creek and located downgradient of the surface impoundment. Additional wells that may be useful in expanding the quarterly assessment monitoring network include wells I-2, R-2, R-4 and I-4. Additionally, the Ground Water Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

The presence of methylene chloride, acetone and carbon disulfide should be evaluated in future sampling events to determine whether these compounds can be attributed to the facility or to laboratory contamination.

<u>Violation 4</u> OAC Rule 3745-65-94(B)(2)

Ekco Housewares has failed to annually, until final closure of the facility, submit to the director a report containing the results of the ground water quality assessment program which includes the concentrations, extent and calculated rate of migration of hazardous waste or hazardous waste constituents in the ground water.

The annual reports submitted for 1988 and 1989 quarterly ground water monitoring did not meet minimum content requirements of the OAC. An annual report was submitted in 1991 for data collected during the preceding year but this report failed to make a determination of the rate and extent of hazardous waste or hazardous waste constituents in the ground water nor did it discuss the concentrations observed. Well R-5 is considered to be part of the assessment monitoring network by the Ohio EPA and therefore, analytical data for this well needs to be submitted in the annual report.

<u>Deficiencies</u>

<u>Deficiency 1.</u> An inspection of the L-series wells noted a few maintenance deficiencies.

a. Survey marks for measuring water level elevations should be permanently installed on the well casings.

b. Well identification numbers should be clearly labeled on all wells. Wells L-5, L-2 and L-1 have no visible identification numbers and the number is barely visible on well L-4.

c. The cement apron surrounding wells L-3 and L-1 are starting to crack and will need repaired in the near future.

d. The locking mechanism on well L-1 is broken and does not prevent unauthorized access to this well. The protective casing should be repaired and locked. This well is also located in an area of potential traffic and therefore, should have guard posts installed to further protect the wellcasing.

e. During the CME inspection Newman Creek was in flood stage and showed evidence of having recently overflowed its banks. Wells L-4 and L-5 are located on the flood plain of Newman Creek and potentially may become submerged during periods of high water flow. This is evidenced by the presence of water-deposited trash and organic debris around the bases of wells L-4 and L-5. Furthermore, L-4 has no end cap covering the inner casing and the end cap covering L-5 is broken into two pieces, therefore, river waters are free to enter the wells. Water-tight end caps should be installed on wells L-4 and L-5.

Deficiency 2. All sampling of ground water at the facility should be performed according to approved protocol in the Sampling and Analysis Plan. This includes wells sampled by both Ekco Housewares personnel and their consultant.

Deficiency 3. The ground water flow map generated from measurements made during February 1991 suggests that well L-3 may not be located upgradient of the lagoon at all times during the year. Methylene Chloride was detected in this well at concentrations that exceeded the levels observed in trip blanks during February and August, 1990. The analytical results for future quarters should be examined closely to determine whether ground water contamination detected in well L-3 is due to a change in ground water flow direction or laboratory contamination.

VIII. TABLES

Table 1. Dates of Known Sampling Events at the Facility Since the 1988 CME Inspection

Well	Date
L-Series	2-7-91 11-9-90 8-9/10-90 5-8-90 2-9-90 12-?-88
Ohio Water Service (wells 1,2,3 & 5)	3-9-90 2-9-90 1-12-90 12-13-89 11-11-89 10-10-89 9-12-89 8-11-89 7-12-89 6-8-89 5-11-89 4-13-89 3-10-89
South Well (W-1)	12-4-90 9-5-90 6-4-90 3-5-90 12-?-88
Well W-10	12-4-90 9-5-90 6-4-90 3-5-90 12-?-88
R-Series (Wells 1,2,3 & 4)	12-4-90 9-5-90 6-4-90 3-5-90
Well R-5	12-?-88
I-Series	12-?-88
S-7	12-?-88
OWS-4	12-?-88
D-4-30	12-?-88

Table 2. Parameters Exceeding Primary and Secondary Drinking Water Standards during Assessment Sampling Events

Well	Date	Compound	Concentration mg/l	EPA Standard mg/l
L-1	11-88	iron	1120	0.03(s)
		manganese	5590	0.05(s)
L-2	11-88	barium*	54.0	1.0(p)
		manganese	854	0.05(s)
L-3	11-88	iron	23500	0.03(s)
		manganese	4230	0.05(s)
		zinc*	17.0	5.0(s)
L-4	11-88	arsenic*	13	0.05(p)
		barium*	148	1.0(p)
		iron	808	0.03(s)
		manganese	3530	0.05(s)
L-5	11-88	arsenic*	7.0	0.05(p)
		barium*	62.0	1.0(p)
		iron	1040	0.03(s)
		lead	6.0	0.05(p)
		manganese	268	0.05(s)
R-5	11-88	arsenic*	7.0	0.05(p)
		iron	3520	0.03(s)
		manganese	734	0.05(s)

(p) = Primary Standard
(s) = Secondary Standard
* = Ekco states that these parameters are present in the field blank, however, a review of the available field and trip blank data suggests that theses blanks either were not analyzed or showed non-detection of the parameters

Table 3. Volatile Organic Compounds Detected During Assessment Sampling Events

Well	Date	Compound	Concentration ug/l	Trip Blank
L-1	11-88	Vinyl Chloride	48.0	----
		Methylene Chloride	30.0	10
		Acetone	11.0	6
		1,1-Dichloroethene	3.0j	----
		1,1-Dichloroethane	67.0	----
		1,2-Dichloroethene	61.0	----
		1,1,1-Trichloroethane	49.0	----
		Trichloroethene	210	----
	2-90	Vinyl Chloride	24	----
		1,1-Dichloroethene	2	----
		1,1,1-Trichloroethane	16	----
		1,1-Dichloroethane	68	----
		1,2-Dichloroethene	58	----
		Trichloroethene	130	----
	5-90	Vinyl Chloride	10	----
		Methylene Chloride	2	5
		1,1,1-Trichloroethane	10	----
		1,1-Dichloroethane	28	----
		1,2-Dichloroethene	22	----
		Trichloroethene	47	----
	8-90	Vinyl Chloride	13	----
		Methylene Chloride	2	----
		1,1,1-Trichloroethane	12	----
		1,1-Dichloroethane	29	----
		1,2-Dichloroethene	25	----
		Trichloroethene	41	----
	11-90	Vinyl Chloride	5	----
		1,1-Dichloroethene	0.7	----
		1,1-Dichloroethane	12	----
		1,2-Dichloroethene	8	----
		1,1,1-Trichloroethane	11	----
		Trichloroethene	130	----
		Vinyl Chloride	4 dup.	----
		1,1-Dichloroethane	10 dup.	----
		1,2-Dichloroethene	6 dup.	----
		1,1,1-Trichloroethane	2 dup.	----
		Trichloroethene	13 dup.	----
L-2	11-88	Methylene Chloride	31.0	10
		Acetone	10.0	6
		1,1,1-Trichloroethane	26.0	----

		Trichloroethane	130	----
	2-90	1,1-Dichloroethane	11	----
		Vinyl Chloride	83	----
		1,2-Dichloroethene	82	----
		1,1-Dichloroethane	1 dup.	----
		1,2-Dichloroethene	2 dup.	----
		1,1,1-Trichloroethane	17 dup.	----
		Trichloroethene	180 dup.	----
	5-90	1,1-Dichloroethane	1	----
		1,2-Dichloroethene	2	----
		1,1,1-Trichloroethane	10	----
		Trichloroethene	320	----
	8-90	Methylene Chloride	2	----
		1,1-Dichloroethane	1	----
		1,2-Dichloroethene	10	----
		1,1,1-Trichloroethane	12	----
		Trichloroethene	180	----
	11-90	Vinyl Chloride	26	----
		1,1-Dichloroethene	2	----
		1,1-Dichloroethane	53	----
		1,2-Dichloroethene	27	----
		1,1,1-Trichloroethane	6	----
		Trichloroethene	37	----
L-3	11-88	Methylene Chloride	6.0	10
	2-90	Methylene Chloride	1	0.4
	8-90	Methylene Chloride	2	----
L-4	11-88	Methylene Chloride	5.0	10
	2-90	Vinyl Chloride	2	----
		Methylene Chloride	1	0.4
		1,1-Dichloroethane	9	----
		1,2-Dichloroethene	17	---
	5-90	Vinyl Chloride	2	----
		Methylene Chloride	2	5
		1,1-Dichloroethane	10	----
		1,2-Dichloroethene	19	----
	8-90	Vinyl Chloride	7	----
		Methylene Chloride	2	----
		Carbon Disulfide	2	----
		1,1-Dichloroethane	19	----
		1,2-Dichloroethene	48	----
		Vinyl Chloride	6 dup.	----

		Carbon Disulfide	10 dup.	----
		1,1-Dichloroethane	20 dup.	----
		1,2-Dichloroethene	47 dup.	----
	11-90	1,1,1-Trichloroethane	4	----
		Trichloroethene	75	----
L-5	11-88	Vinyl Chloride	110	----
		Methylene Chloride	62.0	10
		Acetone	74.0	6
		1,1-Dichloroethane	4.0j	----
		1,2-Dichloroethene	92.0	----
	2-90	Methylene Chloride	2	0.4
		1,1-Dichloroethane	1	----
		1,2-Dichloroethene	2	----
		1,1,1-Trichloroethane	17	----
		Trichloroethene	180	----
	5-90	1,1-Dichloroethane	14	----
		Vinyl Chloride	71	----
		1,2-Dichloroethene	70	----
		Methylene Chloride	2 dup.	5
		1,1-Dichloroethane	14 dup.	----
		Vinyl Chloride	47 dup.	----
		1,2-Dichloroethene	64 dup.	----
	8-90	Carbon Disulfide	43	----
		1,1-Dichloroethane	19	----
		Vinyl Chloride	110	----
		1,2-Dichloroethene	64	----
	11-90	Vinyl Chloride	150	----
		Chloroethane	2	----
		Acetone	3	----
		1,1-Dichloroethane	18	----
		1,2-Dichloroethene	68	----
R-5	11-88	Methylene Chloride	0.97	10
		1,1-Dichloroethene	0.84	----
		1,1-Dichloroethane	4.9	----
		1,2-Dichloroethene	100	----
		Chloroform	0.55	----
		Trichloroethene	40	----
	2-90	No data provided		
	5-90	No data provided		
	8-90	No data provided		

11-90 No data provided

j = Present at less than detection limit with estimated concentration

dup. = Duplicate sample

IX. FIGURES

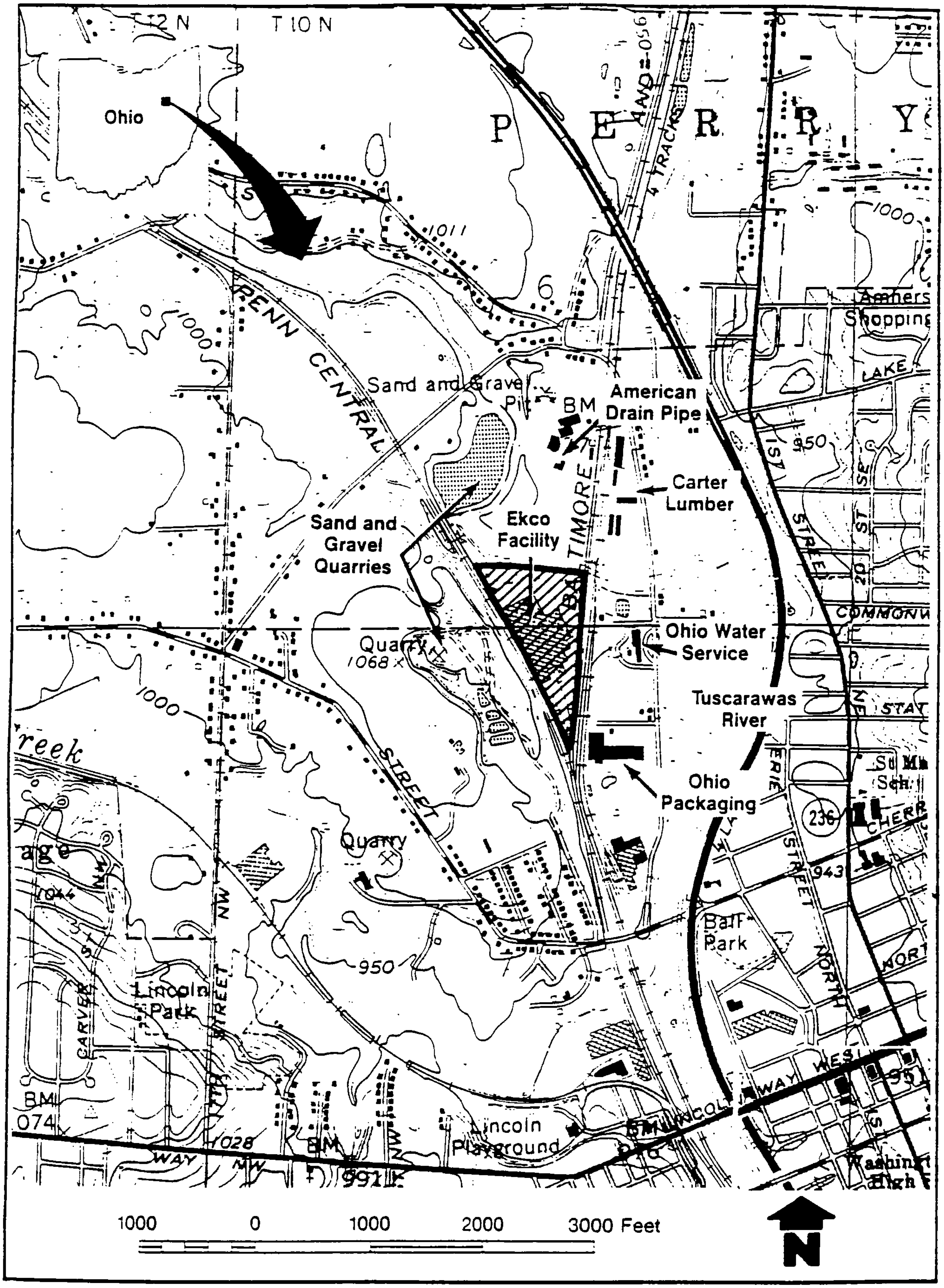

FIGURE 1 SITE LOCATION MAP
EKCO HOUSEWARES, INC., MASSILLON, OHIO
(Ref. 7.5 Minute Massillon Quad, Ohio, 1978)

WESTON

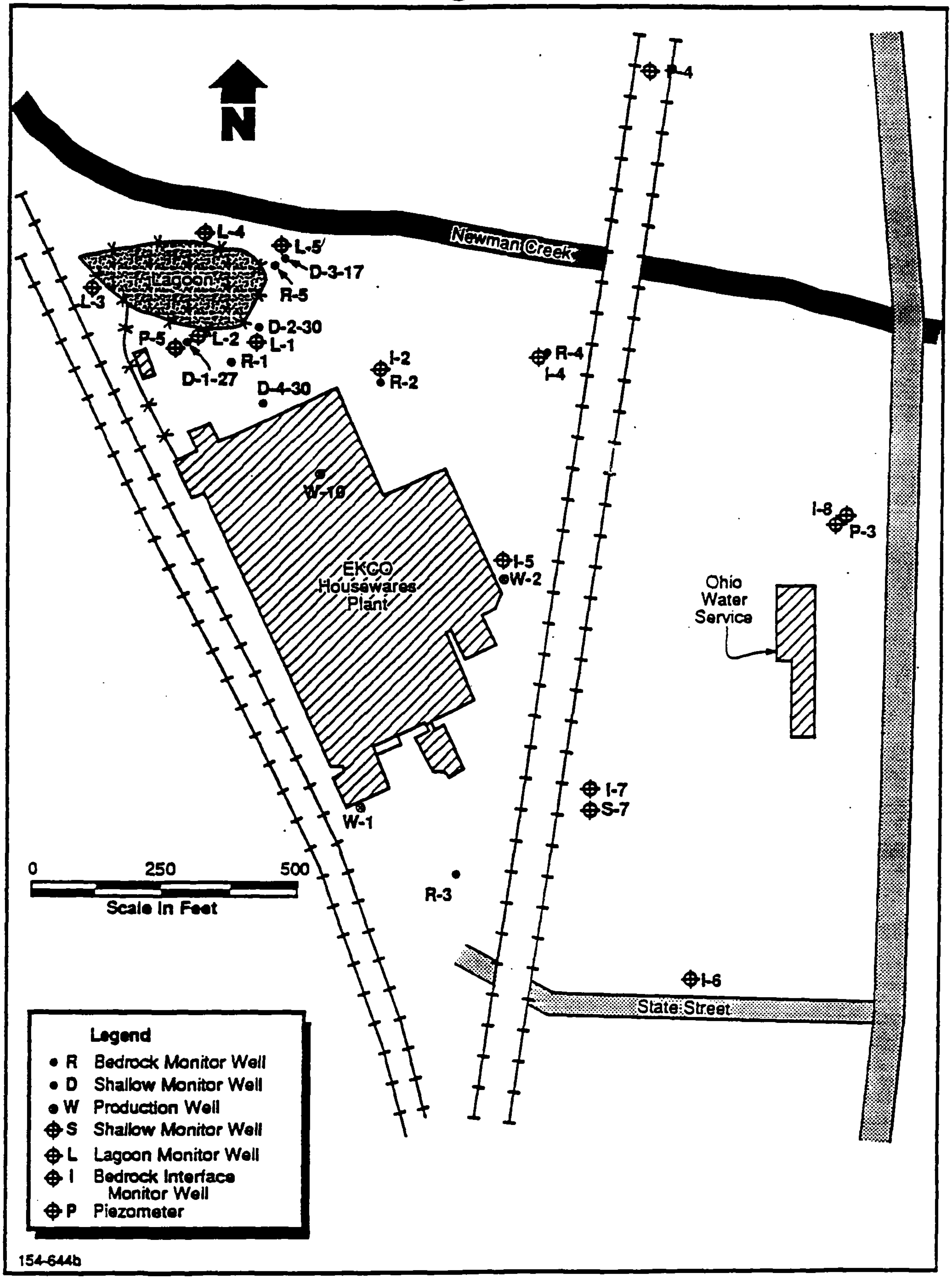

FIGURE 2 WELL LOCATION MAP FOR EKCO HOUSEWARES FACILITY

WESTON

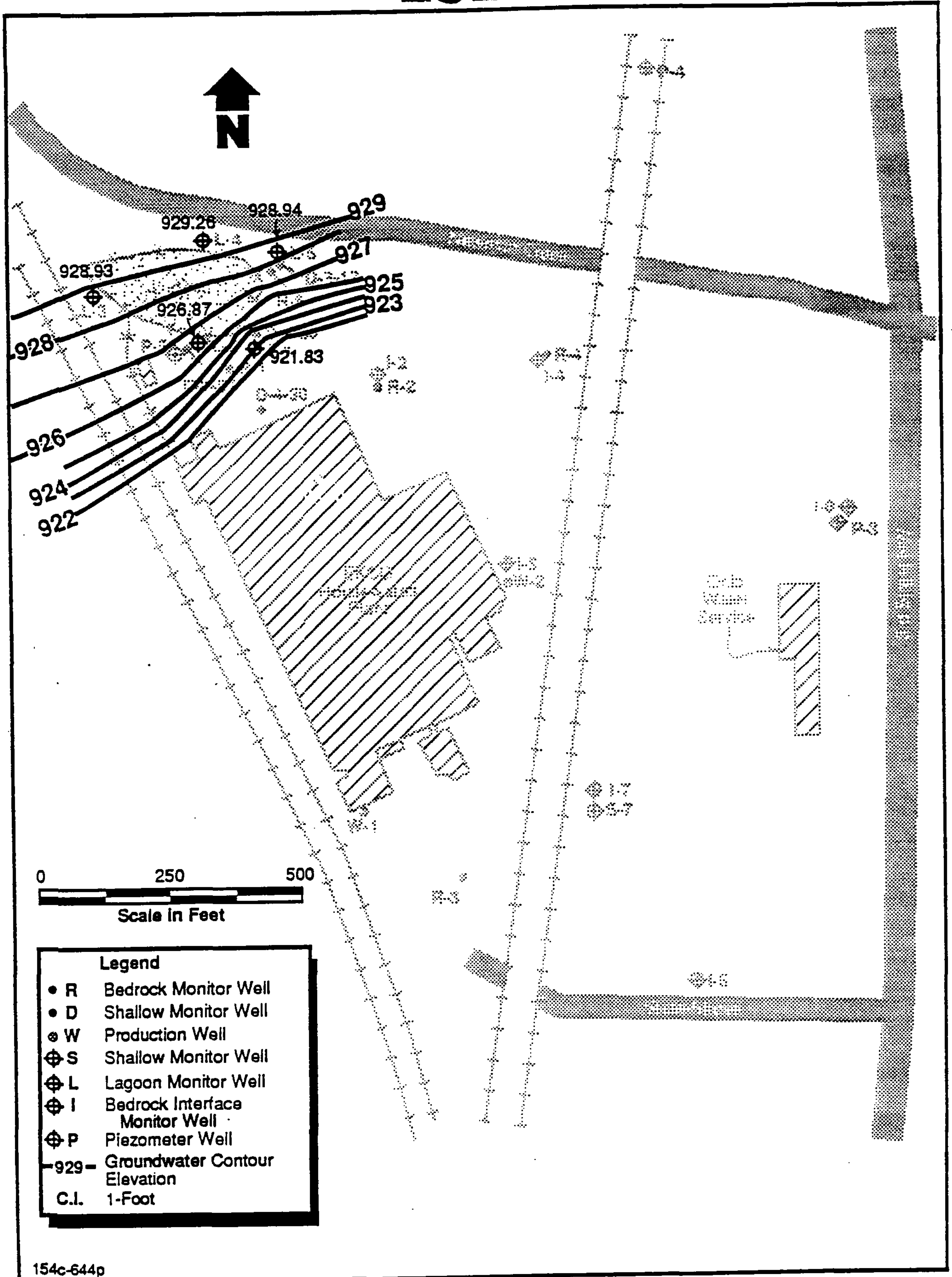

FIGURE 3 GROUNDWATER CONTOUR MAP FOR LAGOON WELLS. WATER LEVELS MEASURED 8-10-88.

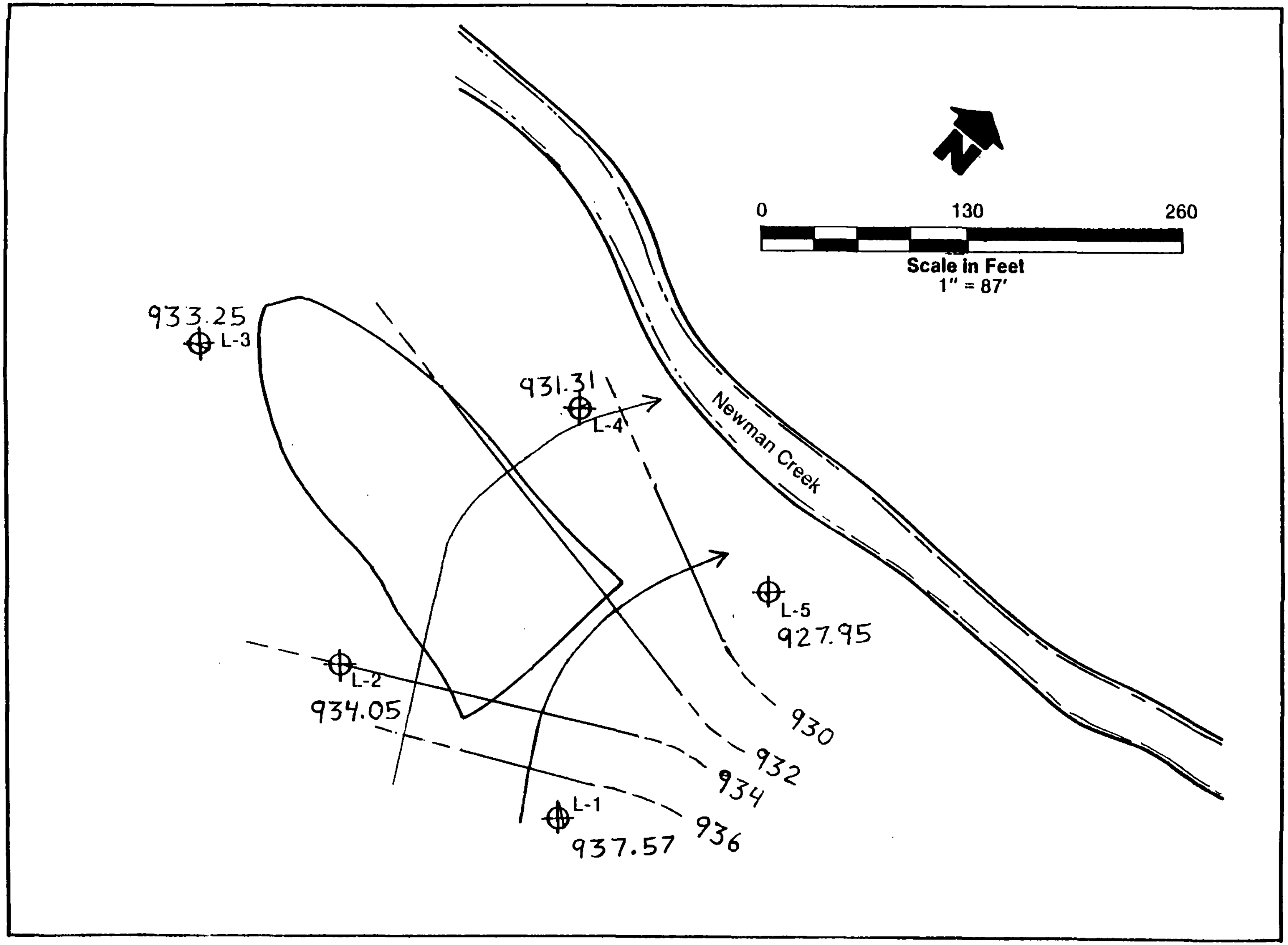

Figure 4. Ground water flow map for Ekco Housewares, Massillon, Ohio. Water elevations measured on February 7, 1991. Prepared by the Ohio EPA.

X. APPENDICES

APPENDIX A

COMPREHENSIVE GROUND-WATER MONITORING EVALUATION WORKSHEET

The following worksheets have been designed to assist the enforcement officer/ technical reviewer in evaluating the ground-water monitoring system an owner/operator uses to collect and analyze samples of ground water. The focus of the worksheets is technical adequacy as it relates to obtaining and analyzing representative samples of ground water. The basis of the worksheets is the final RCRA Ground Water Monitoring Technical Enforcement Guidance Document which describes in detail the aspects of ground-water monitoring which EPA deems essential to meet the goals of RCRA. Appendix A is not a regulatory checklist. Specific technical deficiencies in the monitoring system can, however, be related to the regulations as illustrated in Figure 4.3 taken from the RCRA Ground-Water Monitoring Compliance Order Guide (COG) (included at the end of the appendix). The enforcement officer, in developing an enforcement order, should relate the technical assessment from the worksheets to the regulations using Figure 4.3 from the COG as a guide.

Comprehensive Ground-Water Monitoring Evaluation	Y/N
I. Office Evaluation Technical Evaluation of the Design of the Ground-Water Monitoring System A. Review of Relevant Documents 1. What documents were obtained prior to conducting the inspection: a. RCRA Part A permit application?	N
b. RCRA Part B permit application?	N
c. Correspondence between the owner/operator and appropriate agencies or citizen's groups?	Y
d. Previously conducted facility inspection reports?	Y
e. Facility's contractor reports?	Y
f. Regional hydrogeologic, geologic, or soil reports?	Y
g. The facility's Sampling and Analysis Plan?	
h. Ground-water Assessment Program Outline (or Plan, if the facility is in assessment monitoring)?	Y
i. Other (specify) EKco RFI/CMS Work Plan, June 1989 Closure Plan, August 1988	

Y = YES
N = NO
N/A = NOT APPLICABLE
N S = NOT SPECIFIED
* = COMMENT NUMBER

	Y/N
B. Evaluation of the Owner/Operator's Hydrogeologic Assessment 1. Did the owner/operator use the following direct techniques in the hydrogeologic assessment:	
a. Logs of the soil borings/rock corings (documented by a professional geologist, soil scientist, or geotechnical engineer)?	Y
b. Materials tests (e.g., grain-size analyses, standard penetration tests, etc.)?	N
c. Piezometer installation for water level measurements at different depths?	Y
d. Slug tests?	N
e. Pump tests?	Y
f. Geochemical analyses of soil samples?	Y
g. Other (specify) (e.g., hydrochemical diagrams and wash analysis)	—
2. Did the owner/operator use the following indirect techniques to supplement direct technique data:	
a. Geophysical well logs?	N
b. Tracer studies?	N
c. Resistivity and/or electromagnetic conductance?	N
d. Seismic Survey?	N
e. Hydraulic conductivity measurements of cores?	N
f. Aerial photography?	N
g. Ground penetrating radar?	N
h. Other (specify)	N
3. Did the owner/operator document and present the raw data from the site hydrogeologic assessment?	Y*
4. Did the owner/operator document methods (criteria) used to correlate and analyze the information?	Y
5. Did the owner/operator prepare the following:	
a. Narrative description of geology?	Y
b. Geologic cross sections?	Y
c. Geologic and soil maps?	Y
d. Boring/coring logs?	Y
e. Structure contour maps of the differing water bearing zone and confining layers?	Y
f. Narrative description and calculation of ground-water flows?	Y

	Y/N
g. Water table/potentiometric map?	Y
h. Hydrologic cross sections?	Y
6. Did the owner/operator obtain a regional map of the area and delineate the facility?	Y
If yes, does this map illustrate: a. Surficial geology features?	Y
b. Streams, rivers, lakes, or wetlands near the facility?	Y
c. Discharging or recharging wells near the facility?	Y
7. Did the owner/operator obtain a regional hydrogeologic map?	Y
If yes, does this hydrogeologic map indicate: a. Major areas of recharge/discharge?	N
b. Regional ground-water flow direction?	N
c. Potentiometric contours which are consistent with observed water level elevations?	N
8. Did the owner/operator prepare a facility site map?	Y
If yes, does the site map show: a. Regulated units of the facility (e.g., landfill areas, impoundments)?	Y
b. Any seeps, springs, streams, ponds, or wetlands?	Y
c. Location of monitoring wells, soil borings, or test pits?	Y
d. How many regulated units does the facility have? One	
If more than one regulated unit then, • Does the waste management area encompass all regulated units?	Y
• Is a waste management area delineated for each regulated unit?	Y
C. Characterization of Subsurface Geology of Site 1. Soil boring/test pit program:	
a. Were the soil borings/test pits performed under the supervision of a qualified professional?	Y
b. Did the owner/operator provide documentation for selecting the spacing for borings?	Y
c. Were the borings drilled to the depth of the first confining unit below the uppermost zone of saturation or ten feet into bedrock?	N/A*
d. Indicate the method(s) of drilling:	

	Y/N
Auger (hollow or solid stem) X Mud rotary ___ Reverse rotary ___ Cable tool X Jetting ___ Other (specify) ___	
e. Were continuous sample corings taken?	Y
f. How were the samples obtained (check method[s]) • Split spoon X • Shelby tube, or similar ___ • Rock coring ___ • Ditch sampling ___ • Other (explain) ___	
g. Were the continuous sample corings logged by a qualified professional in geology?	Y
h. Does the field boring log include the following information: • Hole name/number?	Y
• Date started and finished?	Y
• Driller's name?	Y
• Hole location (i.e., map and elevation)?	Y
• Drill rig type and bit/auger size?	Y
• Gross petrography (e.g., rock type) of each geologic unit?	Y
• Gross mineralogy of each geologic unit?	N
• Gross structural interpretation of each geologic unit and structural features (e.g., fractures, gouge material, solution channels, buried streams or valleys, identification of depositional material)?	N
• Development of soil zones and vertical extent and description of soil type?	Y
• Depth of water bearing unit(s) and vertical extent of each?	Y
• Depth and reason for termination of borehole? Reason not given	Y
• Depth and location of any contaminant encountered in borehole?	Y
• Sample location/number?	Y
• Percent sample recovery?	N
• Narrative descriptions of: —Geologic observations?	Y
—Drilling observations?	Y
i. Were the following analytical tests performed on the core samples: • Mineralogy (e.g., microscopic tests and x-ray diffraction)?	N
• Petrographic analysis: —degree of crystallinity and cementation of matrix?	N
—degree of sorting, size fraction (i.e., sieving), textural variations?	N
—rock type(s)?	N

	Y/N
—soil type?	N
—approximate bulk geochemistry?	N
—existence of microstructures that may effect or indicate fluid flow?	N
• Falling head tests?	N
• Static head tests?	N
• Settling measurements?	N
• Centrifuge tests?	N
• Column drawings?	N
D. Verification of Subsurface Geological Data	
1. Has the owner/operator used indirect geophysical methods to supplement geological conditions between borehole locations?	N
2. Do the number of borings and analytical data indicate that the confining layer displays a low enough permeability to impede the migration of contaminants to any stratigraphically lower water-bearing units?	N
3. Is the confining layer laterally continuous across the entire site?	N/A *
4. Did the owner/operator consider the chemical compatibility of the site-specific waste types and the geologic materials of the confining layer?	N
5. Did the geologic assessment address or provide means for resolution of any information gaps of geologic data?	Y *
6. Do the laboratory data corroborate the field data for petrography?	N/A
7. Do the laboratory data corroborate the field data for mineralogy and subsurface geochemistry?	N/A
E. Presentation of Geologic Data	
1. Did the owner/operator present geologic cross sections of the site?	Y
2. Do cross sections:	
a. identify the types and characteristics of the geologic materials present?	Y
b. define the contact zones between different geologic materials?	Y
c. note the zones of high permeability or fracture?	N
d. give detailed borehole information including:	

	Y/N
• location of borehole?	Y
• depth of termination?	Y
• location of screen (if applicable)?	Y
• depth of zone(s) of saturation?	Y
• backfill procedure?	Y
3. Did the owner/operator provide a topographic map which was constructed by a licensed surveyor?	N
4. Does the topographic map provide:	
a. contours at a maximum interval of two-feet?	N
b. locations and illustrations of man-made features (e.g., parking lots, factory buildings, drainage ditches, storm drain, pipelines, etc.)?	Y *
c. descriptions of nearby water bodies?	Y *
d. descriptions of off-site wells?	Y *
e. site boundaries?	Y *
f. individual RCRA units?	Y *
g. delineation of the waste management area(s)?	Y *
h. well and boring locations?	Y *
5. Did the owner/operator provide an aerial photograph depicting the site and adjacent off-site features?	N
6. Does the photograph clearly show surface water bodies, adjacent municipalities, and residences and are these clearly labelled?	N/A
F. Identification of Ground-Water Flowpaths	
1. Ground-water flow direction	
a. Was the well casing height measured by a licensed surveyor to the nearest 0.01 foot?	Y
b. Were the well water level measurements taken within a 24 hour period?	Y
c. Were the well water level measurements taken to the nearest 0.01 foot?	Y
d. Were the well water levels allowed to stabilize after construction and development for a minimum of 24 hours prior to measurements?	Y
e. Was the water level information obtained from (check appropriate one): • multiple piezometers placed in single borehole? ____ • vertically nested piezometers in closely spaced separate boreholes? ____ • monitoring wells? X	

	Y/N
f. Did the owner/operator provide construction details for the piezometers?	Y
g. How were the static water levels measured (check method[s]). • Electric water sounder X • Wetted tape ____ • Air line ____ • Other (explain) ____	
h. Was the well water level measured in wells with equivalent screened intervals at an equivalent depth below the saturated zone?	Y
i. Has the owner/operator provided a site water table (potentiometric) contour map?	Y
If yes, • Do the potentiometric contours appear logical and accurate based on topography and presented data? (Consult water level data)	Y
• Are ground-water flow-lines indicated?	N
• Are static water levels shown?	Y
• Can hydraulic gradients be estimated?	Y
j. Did the owner/operator develop hydrologic cross sections of the vertical flow component across the site using measurements from all wells?	N
k. Do the owner/operator's flow nets include: • piezometer locations?	Y
• depth of screening?	N
• width of screening?	N
• measurements of water levels from all wells and piezometers?	Y
2. Seasonal and temporal fluctuations in ground-water a. Do fluctuations in static water levels occur? If yes, are the fluctuations caused by any of the following:	Y
—Off-site well pumping	NS*
—Tidal processes or other intermittent natural variations (e.g., river stage, etc.)	Y
—On-site well pumping	Y
—Off-site, on-site construction or changing land use patterns	NS
—Deep well injection	N
—Seasonal variations	Y
—Other (specify) ____	
b. Has the owner/operator documented sources and patterns that contribute to or affect the ground-water patterns below the waste management area?	Y
c. Do water level fluctuations alter the general ground-water gradients and flow directions?	Y
d. Based on water level data, do any head differentials occur that may indicate a vertical flow component in the saturated zone?	NS*

	Y/N
e. Did the owner/operator implement means for gauging long term effects on water movement that may result from on-site or off-site construction or changes in land-use patterns?	Y
3. Hydraulic conductivity a. How were hydraulic conductivities of the subsurface materials determined?	
• Single-well tests (slug tests)?	N
• Multiple-well tests (pump tests)	Y
• Other (specify) ______	
b. If single-well tests were conducted, were they done by: • Adding or removing a known volume of water?	N/A
• Pressurizing well casing?	N/A
c. If single well tests were conducted in a highly permeable formation, were pressure transducers and high-speed recording equipment used to record the rapidly changing water levels?	N/A
d. Since single well tests only measure hydraulic conductivity in a limited area, were enough tests run to ensure a representative measure of conductivity in each hydrogeologic unit?	N/A
e. Are the owner/operator's slug test data (if applicable) consistent with existing geologic information (e.g., boring logs)?	N/A
f. Were other hydraulic conductivity properties determined?	N
g. If yes, provide any of the following data, if available: • Transmissivity 12,000 to 68,000 gpd/ft (R-wells) • Storage coefficient 0.0001 to 0.002 (R-wells) • Leakage ______ • Permeability ______ • Porosity ______ • Specific capacity ______ • Other (specify) ______	
4. Identification of the uppermost aquifer a. Has the extent of the uppermost saturated zone (aquifer) in the facility area been defined? If yes,	N *
• Are soil boring/test pit logs included?	Y
• Are geologic cross-sections included?	Y
b. Is there evidence of confining (competent, unfractured, continuous, and low permeability) layers beneath the site? If yes,	N
• how was continuity demonstrated? ______	
c. What is the hydraulic conductivity of the confining unit? (cm/sec.)	N/A
d. How was it determined?	N/A

	Y/N
e. Does potential for other hydraulic communication exist (e.g., lateral discontinuity between geologic units, facies changes, fracture zones, cross cutting structures, or chemical corrosion/alteration of geologic units by leachate)? If yes or no, what is the rationale? Interbedding of fill material, sand and gravel, silt and sandstone bedrock.	Y
G. Office Evaluation of the Facility's Ground-Water Monitoring System—Monitoring Well Design and Construction: These questions should be answered for each different well design present at the facility. 1. Drilling Methods a. What drilling method was used for the well? • Hollow-stem auger ☒ • Solid-stem auger ☐ • Mud rotary (water) ☐ • Air rotary ☐ • Reverse rotary ☐ • Cable tool ☒ • Jetting ☐ • Air drill w/ casing hammer ☐ • Other (specify) ________	
b. Were any cutting fluids (including water) or additives used during drilling? If yes, specify: • Type of drilling fluid ________ • Source of water used Formation water • Foam ________ • Polymers ________ • Other ________	N
c. Was the cutting fluid, or additive, identified?	N/A
d. Was the drilling equipment steam-cleaned prior to drilling the well? • Other methods ________	Y
e. Was compressed air used during drilling? If yes, • was the air filtered to remove oil?	N
f. Did the owner/operator document procedure for establishing the potentiometric surface? If yes, • how was the location established?	Y *
g. Formation samples	

	Y/N
• Were formation samples collected initially during drilling?	Y
• Were any cores taken continuously?	Y*
• If not, at what interval were samples taken?	*
• How were the samples obtained? X Split spoon —Shelby tube —Core drill —Other (specify)	
• Identify if any physical and/or chemical tests were performed on the formation samples (specify) HNU organic vapor meter, Blow counts, Field determination of grain size, color, texture and any contamination	
2. Monitoring Well Construction Materials a. Identify construction materials (by number) and diameters (ID/OD) Material / Diameter • Primary Casing: low Carbon Steel / 6" & 4" I.D. or 2" PVC • Secondary or outside casing (double construction): ____ / ____ • Screen: Stainless Steel / 4" I.D. or 2" PVC	
b. How are the sections of casing and screen connected? • Pipe sections threaded	Threaded
• Couplings (friction) with adhesive or solvent	
• Couplings (friction) with retainer screws	
• Other (specify)	
c. Were the materials steam-cleaned prior to installation? • If no, how were the materials cleaned? ____	Y
3. Well Intake Design and Well Development a. Was a well intake screen installed?	Y
• What is the length of the screen for the well?	10 ft.
• Is the screen manufactured?	Y
b. Was a filter pack installed?	Y
• What kind of filter pack was employed? no. 2 sand	
• Is the filter pack compatible with formation materials?	Y
• How was the filter pack installed? poured in	

	Y/N
• What are the dimensions of the filter pack? 8 inch by approximately 12 feet depending on well	
• Has a turbidity measurement of the well water ever been made?	N
• Have the filter pack and screen been designed for the in-situ materials?	Y
c. Well development • Was the well developed?	Y
• What technique was used for well development? —Surge block X—Bailer X—Air surging X—Water pumping —Other (specify) ____	
4. Annular Space Seals a. What is the annular space in the saturated zone directly above the filter pack filled with: X—Sodium bentonite (specify type and grit) (Pellets) —Cement (specify neat or concrete) —Other (specify)	
b. Was the seal installed by: —Dropping material down the hole and tamping —Dropping material down the inside of hollow-stem auger —Tremie pipe method —Other (specify)	NS
c. Was a different seal used in the unsaturated zone? If yes,	Y
• Was this seal made with? X—Sodium bentonite (specify type and grit) X—Cement (specify neat or concrete)- Other (specify) Grout mixture of Bentonite and Portland Cement	
• Was this seal installed by? —Dropping material down the hole and tamping —Dropping material down the inside of hollow stem auger —Other (specify)	NS
d. Is the upper portion of the borehole sealed with a concrete cap to prevent infiltration from the surface?	Y
e. Is the well fitted with an above-ground protective device and bumper guards?	Y*
f. Has the protective cover been installed with locks to prevent tampering?	Y

	Y/N
H. Evaluation of the Facility's Detection Monitoring Program 1. Placement of Downgradient Detection Monitoring Wells a. Are the ground-water monitoring wells or clusters located immediately adjacent to the waste management area?	Y
b. How far apart are the detection monitoring wells?	*
c. Does the owner/operator provide a rationale for the location of each monitoring well or cluster?	Y
d. Does the owner/operator identify the well screen lengths of each monitoring well or cluster?	Y
e. Does the owner/operator provide an explanation for the well screen lengths of each monitoring well or cluster?	N
f. Do the actual locations of monitoring wells or clusters correspond to those identified by the owner/operator?	Y
2. Placement of Upgradient Monitoring Wells a. Has the owner/operator documented the location of each upgradient monitoring well or cluster?	Y
b. Does the owner/operator provide an explanation for the location(s) of the upgradient monitoring wells?	Y
c. What length screen has the owner/operator employed in the background monitoring well(s)?	10 feet
d. Does the owner/operator provide an explanation for the screen length(s) chosen?	No
e. Does the actual location of each background monitoring well or cluster correspond to that identified by the owner/operator?	Y
I. Office Evaluation of the Facility's Assessment Monitoring Program 1. Does the assessment plan specify: a. The number, location, and depth of wells?	Y
b. The rationale for their placement and identify the basis that will be used to select subsequent sampling locations and depths in later assessment phases?	Y
2. Does the list of monitoring parameters include all hazardous waste constituents from the facility?	Y

	Y/N
a. Does the water quality parameter list include other important indicators not classified as hazardous waste constituents?	Y
b. Does the owner/operator provide documentation for the listed wastes which are not included?	N/A
3. Does the owner/operator's assessment plan specify the procedures to be used to determine the rate of constituent migration in the ground-water?	Y
4. Has the owner/operator specified a schedule of implementation in the assessment plan?	Y
5. Have the assessment monitoring objectives been clearly defined in the assessment plan?	Y
a. Does the plan include analysis and/or re-evaluation to determine if significant contamination has occurred in any of the detection monitoring wells?	N/A
b. Does the plan provide for a comprehensive program of investigation to fully characterize the rate and extent of contaminant migration from the facility?	Y
c. Does the plan call for determining the concentrations of hazardous wastes and hazardous waste constituents in the ground water?	Y
d. Does the plan employ a quarterly monitoring program?	Y
6. Does the assessment plan identify the investigatory methods that will be used in the assessment phase?	Y
a. Is the role of each method in the evaluation fully described?	Y
b. Does the plan provide sufficient descriptions of the direct methods to be used?	Y
c. Does the plan provide sufficient descriptions of the indirect methods to be used?	N
d. Will the method contribute to the further characterization of the contaminant movement?	Y
7. Are the investigatory techniques utilized in the assessment program based on direct methods?	Y
a. Does the assessment approach incorporate indirect methods to further support direct methods?	N
b. Will the planned methods called for in the assessment approach ultimately meet performance standards for assessment monitoring?	Y
c. Are the procedures well defined?	Y
d. Does the approach provide for monitoring wells similar in design and construction as the detection monitoring wells?	Y

	Y/N
e. Does the approach employ taking samples during drilling or collecting core samples for further analysis?	Y
8. Are the indirect methods to be used based on reliable and accepted geophysical techniques?	N/A
a. Are they capable of detecting subsurface changes resulting from contaminant migration at the site?	N/A
b. Is the measurement at an appropriate level of sensitivity to detect ground-water quality changes at the site?	N/A
c. Is the method appropriate considering the nature of the subsurface materials?	N/A
d. Does the approach consider the limitations of these methods?	N/A
e. Will the extent of contamination and constituent concentration be based on direct methods and sound engineering judgment? (Using indirect methods to substantiate the findings.)	N/A
9. Does the assessment approach incorporate any mathematical modeling to predict contaminant movement?	Y
a. Will site specific measurements be utilized to accurately portray the subsurface?	Y
b. Will the derived data be reliable?	Y *
c. Have the assumptions been identified?	Y
d. Have the physical and chemical properties of the site specific wastes and hazardous waste constituents been identified?	Y
J. Conclusions 1. Subsurface geology a. Have sufficient data been collected to adequately define petrography and petrographic variation?	Y
b. Has the subsurface geochemistry been adequately defined?	N
c. Was the boring/coring program adequate to define subsurface geologic variation?	Y
d. Was the owner/operator's narrative description complete and accurate in its interpretation of the data?	Y
e. Does the geologic assessment address or provide means to resolve any information gaps?	Y
2. Ground-water flowpaths a. Did the owner/operator adequately establish the horizontal and vertical components of ground water flow?	Y

	Y/N
b. Were appropriate methods used to establish ground-water flowpaths?	Y
c. Did the owner/operator provide accurate documentation?	Y
d. Are the potentiometric surface measurements valid?	Y
e. Did the owner/operator adequately consider the seasonal and temporal effects on the ground-water?	N
f. Were sufficient hydraulic conductivity tests performed to document lateral and vertical variation in hydraulic conductivity in the entire hydrogeologic subsurface below the site?	Y
3. Uppermost Aquifer a. Did the owner/operator adequately define the upper-most aquifer?	Y
4. Monitoring Well Construction and Design a. Do the design and construction of the owner/operator's ground-water monitoring wells permit depth discrete ground-water samples to be taken?	Y
b. Are the samples representative of ground-water quality?	Y
c. Are the ground-water monitoring wells structurally stable?	Y
d. Does the ground-water monitoring well's design and construction permit an accurate assessment of aquifer characteristics?	Y
5. Detection Monitoring a. Downgradient Wells • Do the location, and screen lengths of the ground-water monitoring wells or clusters in the detection monitoring system allow the immediate detection of a release of hazardous waste or constituents from the hazardous waste management area to the uppermost aquifer?	Y
b. Upgradient Wells • Do the location and screen lengths of the upgradient (background) ground-water monitoring wells ensure the capability of collecting ground-water samples representative of upgradient (background) ground-water quality including any ambient heterogenous chemical characteristics?	Y
6. Assessment Monitoring a. Has the owner/operator adequately characterized site hydrogeology to determine contaminant migration?	Y
b. Is the detection monitoring system adequately designed and constructed to immediately detect any contaminant release?	Y

	Y/N
c. Are the procedures used to make a first determination of contamination adequate?	Y
d. Is the assessment plan adequate to detect, characterize, and track contaminant migration?	Y
e. Will the assessment monitoring wells, given site hydrogeologic conditions, define the extent and concentration of contamination in the horizontal and vertical planes?	N*
f. Are the assessment monitoring wells adequately designed and constructed?	Y
g. Are the sampling and analysis procedures adequate to provide a true measurement of contamination?	Y
h. Do the procedures used for evaluation of assessment monitoring data result in determinations of the rate of migration, extent of migration, and hazardous constituent composition of the contaminant plume?	N*
i. Are the data collected at sufficient frequency and duration to adequately determine the rate of migration?	Y
j. Is the schedule of implementation adequate?	Y
k. Is the owner/operator's assessment monitoring plan adequate?	Y
• If the owner/operator had to implement his assessment monitoring plan was it implemented satisfactorily?	Y
II. Field Evaluation **A. Ground-Water Monitoring System** 1. Are the numbers, depths, and locations of monitoring wells in agreement with those reported in the facility's monitoring plan? (See Section 3.2.3.)	Y
B. Monitoring Well Construction 1. Identify construction material material diameter a. Primary Casing 4" ID Low carbon Steel b. Secondary or outside casing ______	
2. Is the upper portion of the borehole sealed with concrete to prevent infiltration from the surface?	Y*
3. Is the well fitted with an above-ground protective device?	Y
4. Is the protective cover fitted with locks to prevent tampering? If a facility utilizes more than a single well design, answer the above questions for each well design?	Y*

	Y/N
III. Review of Sample Collection Procedures	
A. Measurement of Well Depths /Elevation	
1. Are measurements of both depth to standing water and depth to the bottom of the well made?	Y
2. Are measurements taken to the 0.01 foot?	Y
3. What device is used? Electric Sounding Device	
4. Is there a reference point established by a licensed surveyor?	N
5. Is the measuring equipment properly cleaned between well locations to prevent cross contamination?	Y *
B. Detection of Immiscible Layers	
1. Are procedures used which will detect light phase immiscible layers?	Y *
2. Are procedures used which will detect heavy phase immiscible layers?	N
C. Sampling of Immiscible Layers	
1. Are the immiscible layers sampled separately prior to well evacuation?	N
2. Do the procedures used minimize mixing with water soluble phases?	N
D. Well Evacuation	
1. Are low yielding wells evacuated to dryness?	Y
2. Are high yielding wells evacuated so that at least three casing volumes are removed?	Y
3. What device is used to evacuate the wells? Teflon bailer	
4. If any problems are encountered (e.g., equipment malfunction) are they noted in a field logbook?	Y

	Y/N
E. Sample Withdrawal	
1. For low yielding wells, are samples for volatiles, pH, and oxidation/reduction potential drawn first after the well recovers?	Y
2. Are samples withdrawn wit: either flurocarbon/resins or stainless steel (316, 304 or 2205) sampling devices?	Y
3. Are sampling devices either bottom valve bailers or positive gas displacement bladder pumps?	Y
4. If bailers are used, is fluorocarbon/resin coated wire, single strand stainless steel wire, or monofilament used to raise and lower the bailer?	N *
5. If bladder pumps are used, are they operated in a continuous manner to prevent aeration of the sample?	N/A
6. If bailers are used, are they lowered slowly to prevent degassing of the water?	Y
7. If bailers are used, are the contents transferred to the sample container in a way that minimizes agitation and aeration?	Y
8. Is care taken to avoid placing clean sampling equipment on the ground or other contaminated surfaces prior to insertion into the well?	Y
9. If dedicated sampling equipment is not used, is equipment disassembled and thoroughly cleaned between samples?	N/A *
10. If samples are for inorganic analysis, does the cleaning procedure include the following sequential steps: a. Nonphosphate detergent wash? b. Dilute acid rinse (HNO_3 or HCl)? c. Tap water rinse? d. Type II reagent grade water?	N *
11. If samples are for organic analysis, does the cleaning procedure include the following sequential steps: a. Nonphosphate detergent wash?	N *
b. Tap water rinse?	N *
c. Distilled/deionized water rinse?	N *
d. Acetone rinse?	N *
e. Pesticide-grade hexane rinse?	N *

	Y/N
12. Is sampling equipment thoroughly dry before use?	Y
13. Are equipment blanks taken to ensure that sample cross-contamination has not occurred?	N *
14. If volatile samples are taken with a positive gas displacement bladder pump, are pumping rates below 100 ml/min?	N/A
F. In-situ or Field Analyses	
1. Are the following labile (chemically unstable) parameters determined in the field:	
a. pH?	Y
b. Temperature?	Y
c. Specific conductivity?	Y
d. Redox potential?	N
e. Chlorine?	N
f. Dissolved oxygen?	N
g. Turbidity?	N
h. Other (specify) ______	N
2. For in-situ determinations, are they made after well evacuation and sample removal?	N/A
3. If sample is withdrawn from the well, is parameter measured from a split portion?	N *
4. Are monitoring equipment calibrated according to manufacturer's specifications and consistent with SW-846?	Y
5. Are the date, procedure, and maintenance for equipment calibration documented in the field logbook?	Y
IV. Review of Sample Preservation and Handling Procedures	
A. Sample Containers	
Are samples transferred from the sampling device directly to their compatible containers?	Y *

	Y/N
2. Are sample containers for metals (inorganics) analyses polyethylene with polypropylene caps?	Y
3. Are sample containers for organics analysis glass bottles with fluorocarbonresin-lined caps?	Y
4. If glass bottles are used for metals samples are the caps fluorocarbonresin-lined?	N/A
5. Are the sample containers for metal analyses cleaned using these sequential steps:	
a. Nonphosphate detergent wash?	N/A *
b. 1:1 nitric acid rinse?	N/A *
c. Tap water rinse?	N/A *
d. 1:1 hydrochloric acid rinse?	N/A *
e. Tap water rinse?	N/A *
f. Distilled/deionized water rinse?	N/A *
6. Are the sample containers for organic analyses cleaned using these sequential steps:	
a. Nonphosphate detergent/hot water wash?	NS *
b. Tap water rinse?	NS *
c. Distilled/deionized water rinse?	NS *
d. Acetone rinse?	NS *
e. Pesticide-grade hexane rinse?	NS *
7. Are trip blanks used for each sample container type to verify cleanliness?	N
B. Sample Preservation Procedures	
1. Are samples for the following analyses cooled to 4°C:	
a. TOC?	N/A
b. TOX?	N/A
c. Chloride?	N/A
d. Phenols?	N/A
e. Sulfate?	N/A
f. Nitrate?	N/A
g. Coliform bacteria?	N/A
h. Cyanide?	N *
i. Oil and grease?	N/A
j. Hazardous constituents (261, Appendix VIII)	N *

	Y/N
2. Are samples for the following analyses field acidified to pH <2 with HNO_3:	
a. Iron?	Y
b. Manganese?	Y
c. Sodium?	Y
d. Total metals?	N/A
e. Dissolved metals?	Y
f. Fluoride?	N/A
g. Endrin?	N/A
h. Lindane?	N/A
i. Methoxychlor?	N/A
j. Toxaphene?	N/A
k. 2,4, D?	N/A
l. 2,4,5 TP Silvex?	N/A
m. Radium?	N/A
n. Gross alpha?	N/A
o. Gross beta?	N/A
3. Are samples for the following analyses field acidified to pH <2 with H_2SO_4:	
a. Phenols?	N/A
b. Oil and grease?	N/A
4. Is the sample for TOC analysis field acidified to pH <2 with HCl?	N/A
5. Is the sample for TOX analysis preserved with 1 ml of 1.1 M sodium sulfite?	N/A
6. Is the sample for cyanide analysis preserved with NaOH to pH >12?	Y
C. Special Handling Considerations	
1. Are organic samples handled without filtering?	Y
2. Are samples for volatile organics transfered to the appropriate vials to eliminate headspace over the sample?	Y
3. Are samples for metal analysis split into two portions?	N
4. Is the sample for dissolved metals filtered through a 0.45 micron filter?	Y
5. Is the second portion not filtered and analyzed for total metals?	N/A
6. Is one equipment blank prepared each day of ground-water sampling?	N

	Y/N
V. Review of Chain-of-Custody Procedures A. Sample Labels 1. Are sample labels used?	Y
2. Do they provide the following information: a. Sample identification number?	Y
b. Name of collector?	Y
c. Date and time of collection?	Y
d. Place of collection?	Y
e. Parameter(s) requested and preservatives used?	Y
3. Do they remain legible even if wet?	Y
B. Sample Seals 1. Are sample seals placed on those containers to ensure samples are not altered?	NS
C. Field Logbook 1. Is a field logbook maintained?	Y
2. Does it document the following: a. Purpose of sampling (e.g., detection or assessment)?	Y
b. Location of well(s)?	Y
c. Total depth of each well?	Y
d. Static water level depth and measurement technique?	Y
e. Presence of immiscible layers and detection method?	N
f. Collection method for immiscible layers and sample identification numbers?	N
g. Well evacuation procedures?	Y
h. Sample withdrawal procedure?	Y
i. Date and time of collection?	Y
j. Well sampling sequence?	Y
k. Types of sample containers and sample identification number(s)?	Y
l. Preservative(s) used?	Y
m. Parameters requested?	Y
n. Field analysis data and method(s)?	Y
o. Sample distribution and transporter?	Y
p. Field observations?	Y

	Y/N
—Unusual well recharge rates?	Y
—Equipment malfunction(s)?	Y
—Possible sample contamination?	Y
—Sampling rate?	Y
D. Chain-of-Custody Record 1. Is a chain-of-custody record included with each sample?	Y
2. Does it document the following: a. Sample number?	Y
b. Signature of collector?	Y
c. Date and time of collection?	Y *
d. Sample type?	Y
e. Station location?	Y
f. Number of containers?	Y
g. Parameters requested?	Y
h. Signatures of persons involved in chain-of-custody?	Y
i. Inclusive dates of custody?	Y
E. Sample Analysis Request Sheet 1. Does a sample analysis request sheet accompany each sample?	Y *
2. Does the request sheet document the following: a. Name of person receiving the sample?	Y
b. Date of sample receipt?	Y
c. Duplicates?	NS
d. Analysis to be performed?	Y
VI. Review of Quality Assurance/Quality Control A. Is the validity and reliability of the laboratory and field generated data ensured by a QA/QC program?	Y
B. Does the QA/QC program include: 1. Documentation of any deviation from approved procedures?	Y

	Y/N
2. Documentation of analytical results for: a. Blanks?	Y
b. Standards?	Y
c. Duplicates?	Y
d. Spiked samples?	Y
e. Detectable limits for each parameter being analyzed?	Y
C. Are approved statistical methods used?	Y
D. Are QC samples used to correct data?	Y
E. Is all data critically examined to ensure it has been properly calculated and reported?	Y
VII. Surficial Well Inspection and Field Observation A. Are the wells adequately maintained?	N *
B. Are the monitoring wells protected and secure?	Y*
C. Do the wells have surveyed casing elevations?	Y*
D. Are the ground-water samples turbid?	N
E. Have all physical characteristics of the site been noted in the inspector's field notes (i.e., surface waters, topography, surface features)?	Y
F. Has a site sketch been prepared by the field inspector with scale, north arrow, location(s) of buildings, location(s) of regulated units, locations of monitoring wells, and a rough depiction of the site drainage pattern?	N *

	Y/N
II. Conclusions	
A. Is the facility currently operating under the correct monitoring program according to the statistical analyses performed by the current operator?	N/A
B. Does the ground-water monitoring system, as designed and operated, allow for detection or assessment of any possible ground-water contamination caused by the facility?	N *
C. Does the sampling and analysis procedure permit the owner/operator to detect and, where possible, assess the nature and extent of a release of hazardous constituents to ground water from the monitored hazardous waste management facility?	N *

CHECKLIST A - ADDENDUM AND COMMENTS

I.B.3. The raw data is available through an exhaustive document search because it is not presented in a single concise report.

I.C.1.c. A confining unit has not been identified below the site.

I.D.3. A confining unit has not been identified below the site.

I.D.5. The Ground Water Quality Assessment Report suggests that additional shallow and interface wells are needed to further evaluate ground water quality. This report further suggests that a screened recovery well be used in the unconsolidated sediments to completely contain contaminants.

I.E.4.b.-h. Various site maps prepared by the consultant provide all this information except for topographic contour lines at a two-foot maximum interval.

I.F.2.a. City water supply production wells are operating near the facility and may have an effect on the elevation of the water table under the site.

I.F.2.d. Although some nested wells have been installed at the site, they are in different stratigraphic units and have not been analyzed through pumping tests as of the date of the CME inspection.

I.F.4.a. No confining layer has been identified at the site. The surficial sediments and the bedrock aquifers appear to be in communication.

I.G.1.f. Wells were developed by bailing, air lifting and pumping. The water levels were measured after the wells recovered.

I.G.1.g. Split spoon samples were collected at five-foot intervals from wells drilled by hollow stem augers. Cable tool drilling methods do not allow for this type of sample collection.

I.G.4.e. All the L-series wells are fitted with locking protective casings. However, no bumper guards have been installed. Well L-1 is located in an area of potential traffic and should, therefore, have protective bumper guard posts installed nearby.

I.H.1.b. The L-series wells surrounding the lagoon are located from approximately 145 feet apart up to a maximum distance of approximately 365 feet apart.

I.I.9.b. The modflow ground water model is based on several assumptions and calibration. Additional model input parameters must be collected and evaluated to properly use the proposed model. If properly followed, modflow yields acceptable results. The U.S. EPA is coordinating the completion and use of the ground water flow model during the RFI/CMS process.

I.J.6.e. The assessment monitoring network consists of all the L-series wells and well R-5. All downgradient wells have yielded analytical results indicating ground water contamination. Therefore, the assessment monitoring network should be expanded to include additional wells as needed to adequately determine the rate and extent of contamination.

I.J.6.h. See comment I.J.6.e. above.

II.B.2. Concrete aprons have been installed at all of the L-series wells, however, the cement at wells L-3 and L-1 has started to deteriorate and will need repaired in the near future.

II.B.4. All of the L-series wells have protective casings fitted with locks to prevent tampering. However, the hinge on the locking outer casing at well L-1 is broken thus allowing access to the well.

III.A.5. The water elevation measuring equipment is rinsed with distilled deionized water between use. No detergent solution is used, nor is the probe wiped off.

III.B.1. The wells were purged with a three inch diameter teflon bailer. The bail water was then examined for signs of immiscible layers.

III.B.2. An oil water interface probe is not used at the facility, therefore, it is not possible to detect heavy phase immiscible layers.

III.E.4. Dedicated bailers and rope are used to purge and sample each well.

III.E.9. Dedicated and disposable sampling equipment is used.

III.E.10. Samples destined for metals analyses are filtered with dedicated, disposable filters after first being withdrawn using dedicated bailers.

III.E.11.a.-e. Dedicated sample withdrawal equipment is used to obtain samples for organic analyses.

III.E.13. Equipment blanks are not needed because dedicated bailers and disposable filters are used.

III.F.3. The consultant used purge water from the well to obtain measurements of pH and specific conductivity.

IV.A.1. Samples destined for metals analyses first are transfered to a disposable container for filtering.

IV.A.5. Disposable filters and containers are used to hold samples destined for metals analyses.

IV.A.6. The VOA bottles used to collect samples for organic analyses are provided by the laboratory. The decontamination process used by the laboratory is unknown.

IV.B.1.h.&j. No ice was used during sampling to immediately cool samples to 4 degrees celsius. The consultant said that ice would be added to the coolers before shipping to the laboratory.

V.D.2.c. The time of sample collection appears to not be included on the chain-of-custody form.

V.E.1. The requested analyses are included on the chain-of-custody form.

VII.A. Monitoring wells L-1 and L-3 have cracked cement aprons that will require repair in the near future. Wells L-4, L-5 L-2 and L-1 need visible Identification numbers on their casings. Wells L-4 and L-5 are located in a flood prone area and should have water tight end caps installed on the well casings.

VII.B. All of the L-series monitoring wells are protected and secure except for L-1 which has a broken hinge on the locking protective casing thus allowing entrance to the well. Also L-1 is located in potential traffic area and should have a bumper guard post installed.

VII.C. The elevations of the well casings have been surveyed, but no survey location mark has been placed on the casings.

VII.F. During the CME inspection, a site map prepared by the consultant was used for monitor well location verification.

VIII.B. Ekco Housewares needs to expand the monitoring well network to define the full rate and extent of contaminant migration associated with the facility. Additionally, the Groundwater Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

VIII.C. The sampling of the R-series bedrock wells must be consistent with the sampling and analysis procedures as specified in the approved Sampling and Analysis Plan, and not as collected by the Ekco Housewares company staff. This will insure

APPENDIX A-1

FACILITY INSPECTION FORM FOR COMPLIANCE WITH INTERIM STATUS STANDARDS COVERING GROUND-WATER MONITORING

Company Name: EKco Housewares Inc. : EPA I.D. Number: OHD 045205424

Company Address: 359 State Ave, NW : Inspector's Name: R. Kurlich

P.O. Box 560

Massillon, OH 44648

Company Contact/Official: Tom Shingleton : Branch/Organization: Massillon Works

Title: Plant Manager : Date of Inspection: 7 Feb. 91

	Yes	No	Unknown	Comments
Type of facility: (check appropriately)				
a) surface impoundment	X			
b) landfill		X		
c) land treatment facility		X		
d) storage facility		X		
Ground Water Monitoring Plan				
1. Has a ground water monitoring plan been submitted to the Regional Administrator for facilities containing a surface impoundment, landfill, land treatment process, or storage facility?	X			
2. Was the ground water monitoring plan reviewed prior to site visit? If "No," explain.	X			
a) Was the ground water plan reviewed at the facility prior to actual site inspection? If "No," explain.		X		X
3. Has a ground water monitoring program (capable of determining the facility's impact on the quality of ground water in the uppermost aquifer underlying the facility) been implemented? 3745-65-90(A)	X			

	Yes	No	Unknown	Comments
4. Has at least one monitoring well been installed in the uppermost aquifer hydraulically upgradient from the limit of the waste management area? 3745-65-91(A)(1)			X	X
a) Are sufficient ground water samples from the uppermost aquifer, representative of background ground water quality and not affected by the facility, ensured by proper well				
1) Number(s)?		X		*
2) Location?		X		
3) Depth?	X			
5. Have at least three monitoring wells been installed hydraulically downgradient at the limit of the waste handling or management area? 3745-65-91(A)(2)	X			
6. Have the locations of the waste handling, storage, or disposal areas been verified to conform with information in the ground water monitoring plan?	X			
7. Do the numbers, locations, and depths of the ground water monitoring wells agree with the data in the ground water monitoring system program? If "No," explain discrepancies.	X			
8. Have all monitoring wells been cased in a manner that:				
a) maintains the integrity of the bore hole?	X			
b) is screened and packed to enable sample collection at depths where appropriate aquifer flow exists?	X			
c) prevents contamination of samples and ground water by sealing the annular space above the sampling depth with a suitable material? 3745-65-91(C)	X			

	Yes	No	Unknown	Comments
9. Has a ground water sampling and analysis plan been developed? 3745-65-92(A)	X			
a) Has it been followed?	X			
b) Is the plan kept at the facility?	X			
c) Does the plan include procedures and techniques for:				
1) Measuring ground water elevations;	X			
2) Detection of immiscible layers, where applicable;		X		
3) Collecting ground water samples including:				
a) Well evacuation;	X			
b) Sample withdrawal;	X			
c) Sample equipment;	X			
d) Sample containers and handling; and	X			
e) Sample preservation;	X			
4) Performing field analysis, including:				
a) Procedures and forms for recording raw data and the exact location, time, and facility specific considerations associated with the data acquisitions;	X			
b) Calibration of field instruments; and	X			
c) Procedures for sample filtration;	X			
5) Decontamination of equipment;	X			
6) Disposal of purge water;	X			
7) Ground water sample analysis of all applicable constituents associated with the facility including:				
a) Constituents;	X			

	Yes	No	Unknown	Comments
b) Analytical method and detection limit; and	X			
c) Sample holding time;	X			
8) Quality assurance/quality control:				
a) Samples for field/lab/equipment blanks;	X			
b) Duplicate samples; and	X			
c) Potential interferences; and	X			
9) Chain of custody procedures:				
a) Standardized field tracking reporting forms to establish sample custody for the field prior to and during shipping; and	X			
b) Sample labels containing all information necessary for effective sample tracking.	X			
10. Are the required parameters in ground water samples planned to be tested quarterly for the first year? 3745-65-92(B) and (C)(1)		X		X
a) Are the ground water samples analyzed for the following:				
1) Parameters characterizing the suitability of the ground water as a drinking supply? 3745-65-92 B(1)		X		
2) Parameters establishing ground water quality? 3745-65-92 B(2)		X		
3) Parameters used as indicators of ground water contamination? 3745-65-92 B(3)		X		
a) Are at least four replicate measurements obtained for each sample? 3745-65-92 (C)(2)		X		

	Yes	No	Unknown	Comments
b) Are provisions made to calculate the initial background arithmetic mean and variance of the respective parameter concentrations or values obtained from well(s) during the first year?3745-65-92(C)(2)		X		
b) For facilities which have complied with first year ground water sampling and analysis requirements:				
1) Have samples been obtained and analyzed for the indicators of ground water quality at least annually? 3745-65-92(D)(1)		X		
2) Have samples been obtained and analyzed for the indicators of ground water contamination at least semi-annually? 3745-65-92(D)(2)		X		
c) Were ground water surface elevations determined at each monitoring well each time a sample was taken? 3745-65-92(E)	X			
d) Were the ground water surface elevations evaluated to determine whether the monitoring wells are properly placed? 3745-65-93(F)	X			
e) If it was determined that modification of the number, location or depth of monitoring wells was necessary, was the system brought into compliance with 3745-65-91(A)? 3745-65-93(F)	X			X
11. Has an outline of a ground water quality assessment program been prepared? 3745-65-93(A)	X			
a) Does it describe a program capable of determining:				

	Yes	No	Unknown	Comments
1) Whether hazardous waste or hazardous waste constituents have entered the ground water?	X			
2) The rate and extent of migration of hazardous waste or hazardous waste constituents?	X			
3) Concentrations of hazardous waste or hazardous waste constituents in ground water?	X			
b) Have at least four replicate measurements of each indicator parameter been obtained for samples taken for each well? 3745-65-93(B)		X		
1) Were the results compared with the initial background mean?		X		
a) Was each well considered individually?		X		
b) Was the Student's t-test used (at the 0.01 level of significance)?		X		
2) Was a significant increase (or pH decrease) found in the:				
a) Upgradient wells		X		
b) Downgradient wells		X		
If "Yes," Compliance Checklist A-2 must also be completed.				
12. Have records been kept of analyses for parameters establishing ground water quality and indicators of ground water contamination? 3745-65-94(A)(1)		X		
13. Have records been kept of ground water surface elevations taken at the time of sampling for each well? 3745-65-94(A)(1)	X			
14. Have the following been submitted to the Regional Administrator:3745-65-94(A)(2)		X		X

	Yes	No	Unknown	Comments
a) Initial background concentrations of parameters listed in 3745-65-92(B) within 15 days after completing each quarterly analysis required during the first year?		X		
b) For each well, any parameters whose concentrations or values have exceeded the maximum contaminant levels allowed in drinking water supplies?		X		
c) Annual reports including:				
1) Concentrations or values of parameters used as indicators of ground water contamination for each well?		X		
2) Results of the evaluation of ground water surface elevations?		X		

CHECKLIST A-1 - ADDENDUM AND COMMENTS

2.a. The plan was reviewed in the EPA office prior to the actual site visit.

4. The ground water flow map generated from measurements made during the CME inspection in February, 1991, suggests that well L-3 may not be located upgradient of the lagoon at all times during the year. Laboratory results are not yet available from this sampling event to determine whether well L-3 has been influenced by leachate from the surface impoundment. Water elevation and analytical data collected prior to the date of the CME inspection have indicated that well L-3 lies upgradient of the impoundment.

4.a.2. See above.

9.c.2. The Sampling and Analysis Plan does not discuss the detection of immiscible layers.

10. The facility has gone directly into assessment monitoring since contamination was discovered in 1984. A detection monitoring system was never implemented at the facility.

10.e. The facility is currently implementing a U.S. EPA approved Ground Water Quality Assessment Plan to determine the rate and extent of contaminaiton migration. However, Ekco Housewares needs to expand the monitoring well network to define the full rate and extent of contaminant migration associated with the facility. Additionally, the Groundwater Quality Assessment Plan should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

14. See issue 10. above.

APPENDIX A-2

INSPECTION COMPLIANCE FORM FOR A FACILITY WHICH HAS DETERMINED IT MAY BE AFFECTING GROUND WATER QUALITY

Company Name: Ekco Housewares Inc. : EPA I.D. Number: OHD 045205424

Company Address: 359 State Ave. NW : Inspector's Name: R. Kurlich

P.O. Box 560

Massillon, OH 44648

Company Contact/Official: Tom Shingleton : Branch/Organization: Massillon Works

Title: Plant Manager : Date of Inspection: 7 Feb. 91

	Yes	No	Unknown	Comments
Type of facility: (check appropriately)				
a) surface impoundment	X			
b) landfill		X		
c) land treatment facility		X		
d) storage facility		X		
Ground Water Monitoring Plan				
1. Has (Have) comparison(s) of ground water contamination indicator parameters for the upgradient well(s) 3745-65-93(B) shown a significant increase (or pH decrease) over initial background?		X		X
a) If "Yes," has(have) the increase(s) been submitted to the Regional Administrator as part of the annual report? 3745-65-94(A)(2)			N/A	
2. Have comparisons of indicator parameters for the downgradient wells 3745-65-93(B) shown a significant increase (or decrease) over initial background?		X		X

	Yes	No	Unknown	Comments
a) If "Yes," were additional ground water samples taken for those downgradient wells where the significant difference was determined? 3745-65-93 (C)(2)			N/A	
1) Were samples split in two?			N/A	
2) Was the significant difference due to laboratory error?			N/A	
(If "Yes," do not continue.)			N/A	
3. If significant differences were not due to laboratory error, was a written notice sent to the Regional Administrator within 7 days of (laboratory) confirmation? 3745-65-93(D)(1)			N/A	
4. Within 15 days of notification of the Regional Administrator was a ground water quality assessment program submitted? 3745-65-93(D)(2)	X			
a) Does the plan specify 3745-65-93(D)(3):				
1) Hydrogeologic conditions at the facility;	X			
2) The detection monitoring program implemented by the facility, including, but not limited to:				
a) The number, location, depth, and construction of detection monitoring wells with written documentation:			N/A	
b) A summary of detection monitoring analytical data with written documentation of the of the results; and			N/A	
c) A summary of statistical analyses applied to the data;			N/A	
3) The investigative approach to be followed during the assessment, including, but not limited to:				
a) The proposed number, location, depth, installation method, and construction of monitoring wells;	X			

	Yes	No	Unknown	Comments
b) The proposed methods for gathering additional hydrogeologic information;	X			
c) The proposed use of supporting methodology (e.g., soil gas analysis, geophysics); and	X			
d) The proposed methodology for determining contaminant migration rates;	X			
4) Sampling and analysis procedures as specified under paragraph (A) of rule 3745-65-92 of the administrative code;	X			
5) Proposed data evaluation procedures, including, but not limited to:	X			
a) Utilization of statistical data evaluation;	X			
b) Utilization of computer models; and	X			
c) Criteria that will be utilized to determine if additional assessment activities are warranted; and	X			
6) A schedule of implementation.	X			
b) Does the plan allow for determination of: 3745-65-93(D)(4)				
1) Rate and extent of migration of hazardous waste constituents?		X		*
2) Concentrations of the hazardous waste or hazardous waste constituents?	X			
c) Is it indicated that the 1st determination was made as soon as technically feasible? 3745-65-93(D)(5)	X			*
1) Within 15 days after determination, was a written report containing the assessment of ground water quality submitted to the Regional Administrator?			X	*

	Yes	No	Unknown	Comments
d) Has it determined that hazardous waste or hazardous waste constituents from the facility have entered the ground water?	X			*
1) If "No," was the original indication evaluation program, required by (3745-65-92) reinstated?		N/A		
a) Was the Regional Administrator notified of the reinstatement of the program within 15 days of the determination? 3745-65-93(D)(6)		N/A		
e) If it was determined that hazardous waste or hazardous waste constituents have entered the ground water 3745-65-93(D)(7)				
1) For facilities where the program was implemented prior to final closure, have determinations of hazardous waste or hazardous waste constituents continued on a quarterly basis? (If the program was implemented during the post-closure care period, determinations made in accordance with the ground water quality assessment plan may cease.)		X		*
2) Were(are) records kept of the analyses and evaluations specified in the ground water quality assessment plan throughout the active life of the facility? 3745-65-94(B)(1)	X			
a) If a disposal facility, were (are) records kept throughout the post-closure period as well?	N/A			
f) Are annual reports submitted to the Regional Administrator containing the results of the ground water quality assessment program? 3745-65-94(B)(2)	X			
1) Do the reports include the calculated or measured rate of migration of hazardous waste or hazardous waste constituents?		X		

CHECKLIST A-2 - ADDENDUM AND COMMENTS

1. The facility went directly into assessment monitoring when contamination was discovered in 1984. A detection monitoring system was never initiated at the facility.

2. See comment 1. above.

4.b.1. Ekco Housewares needs to expand the monitoring well network to define the full rate and extent of contaminant migration associated with the facility. For this reason, the Groundwater Quality Assessment Plan also should be modified to indicate what existing and proposed wells will be used in the revised ground water monitoring well network for quarterly analyses.

4.c. According to the schedule of implementation as specified by the Consent and Final Orders and the approved Ground Water Quality Assessment Plan.

4.c.1. The Ground Water Quality Assessment Report is dated May 1989. The 16 new wells proposed in the March 1988 Ground Water Quality Assessment Plan were installed in May, June and July 1988. Almost a full year passed between installation of the wells and the submission of the GWQA report.

4.d. See comment 1. above.

4.e.1. Ekco Housewares failed to make quarterly determinations of hazardous waste or hazardous waste constituents in ground water during 1989.